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AGENCY FOR INTERNATIONAL DEVELOPMENT  <b>PROJECT PAPER FACESHEET</b>		1. TRANSACTION CODE <input checked="" type="checkbox"/> A    A = ADD C = CHANGE D = DELETE	PP <b>(2)</b>  2. DOCUMENT CODE 3
3. COUNTRY/ENTITY Burundi		4. DOCUMENT REVISION NUMBER Original <input type="checkbox"/>	
5. PROJECT NUMBER (7 digits) [695-0103]	6. BUREAU/OFFICE A. SYMBOL    B. CODE AFR    [06]	7. PROJECT TITLE (Maximum 40 characters) [Alternative Energy - Peat II]	
8. ESTIMATED FY OF PROJECT COMPLETION FY [8] [5]		9. ESTIMATED DATE OF OBLIGATION A. INITIAL FY [8] [9]    B. QUARTER [4] C. FINAL FY [8] [3]    (Enter 1, 2, 3, or 4)	

10. ESTIMATED COSTS (\$000 OR EQUIVALENT \$1 - )						
A. FUNDING SOURCE	FIRST FY			LIFE OF PROJECT		
	B. FX	C. L/C	D. TOTAL	E. FX	F. L/C	G. TOTAL
AID APPROPRIATED TOTAL	1,800	200	2,000	6,845	1,155	8,000
(GRANT)	(1,800)	(200)	(2,000)	(6,845)	(1,155)	(8,000)
(LOAN)	(-0-)	(-0-)	(-0-)	(-0-)	(-0-)	(-0-)
OTHER U.S. 1.						
2.						
HOST COUNTRY	-0-	306	306	-0-	1,089	1,089
OTHER DONOR(S)	110	-0-	110	1,460	-0-	1,460
TOTALS	1,910	506	2,416	8,305	2,244	10,549

11. PROPOSED BUDGET APPROPRIATED FUNDS (\$000)									
A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE		E. 1ST FY <u>80</u>		H. 2ND FY <u>81</u>		K. 3RD FY <u>82</u>	
		C. GRANT	D. LOAN	F. GRANT	G. LOAN	I. GRANT	J. LOAN	L. GRANT	M. LOAN
(1) SD	743-B	878		2,000		2,500		2,000	
(2)									
(3)									
(4)									
TOTALS				2,000		2,500		2,000	
A. APPROPRIATION		N. 4TH FY <u>83</u>		Q. 5TH FY <u>84</u>		LIFE OF PROJECT		12. IN-DEPTH EVALUATION SCHEDULED	
		O. GRANT	P. LOAN	R. GRANT	S. LOAN	T. GRANT	U. LOAN		
(1) SD		1,500		-0-		8,000		MM YY 07 81	
(2)									
(3)									
(4)									
TOTALS		1,500		-0-		8,000			

13. DATA CHANGE INDICATOR. WERE CHANGES MADE IN THE PID FACESHEET DATA, BLOCKS 12, 13, 14, OR 15 OR IN PRP FACESHEET DATA, BLOCK 12? IF YES, ATTACH CHANGED PID FACESHEET.

1    1 = NO  
2 = YES

14. ORIGINATING OFFICE CLEARANCE SIGNATURE <i>[Signature]</i> TITLE AID Affairs Officer Bujumbura		15. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID W DOCUMENTS, DATE OF DISTRIBUTION DATE SIGNED MM DD YY 01 7 23 81
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## Burundi: Alternative Energy-PEAT II

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## I. Summary and Recommendations

### A. Summary Project Description

The Alternative Energy - Peat II Project is directed towards the goal of maximizing Burundi's limited energy resources by developing a heretofore underutilized resource--peat. The purposes of the project are twofold: first, to conserve the country's forestry reserves, upon which the overwhelming majority of the population (urban and rural) relies for cooking and heating, by increasing the availability and acceptability of peat as an alternative energy source; second, to strengthen the Burundian agency that will be responsible for carrying out this project.

This proposal is the logical next step in an activity that began with Peat I, a pilot AID-funded activity that is now nearing completion. Peat I could not accomplish all that was ambitiously intended for it. However, it was instrumental in initiating several important actions; more importantly, it has identified many of the problem areas and potential pitfalls that will be encountered in the implementation of Peat II. Although the design team has incorporated sufficient flexibility and resources into the project to accomplish the stated objectives, the likely difficulties that will be encountered in reaching those objectives should not be understated.

This project will encourage the substitution of peat for charcoal and wood. Given the inefficiencies of the wood to charcoal conversion process, the project plans to direct priority attention towards consumers of charcoal, who are mostly urban households. However, production of peat is expected to increase faster than demand from urban households, at least initially. Therefore, other markets will be cultivated--artisanal/commercial (brick makers, lime kilns, bakeries), institutional (Burundian Army, missions, schools, hospitals) and industrial (tea factories).

There are a number of marketing, production and organizational obstacles to be overcome during project implementation. The proposed inputs have anticipated most of these. In addition, the willingness of the

Burundian Government to take certain measures will be critical to the success of the project.

In achieving its principal objectives, the project anticipates expansion of production of peat from 6300 tons in 1980 to 47,500 tons in 1985, largely because of the introduction of appropriate machinery. The implementing agency, ONATOUR, is expected to become financially self-sufficient and also to have <sup>been greatly strengthened by</sup> the input of project-financed experts in key areas of financial management, marketing and production. Furthermore, a marketing strategy should be developed and effectively implemented, involving demonstrations, test marketing and promotional efforts, that is expected to result in a switch from charcoal to peat by an estimated 60 percent of Burundi's urban households by 1985. Lastly, up to 2400 full-time and part-time workers are scheduled to occupy long-term employment positions on the bogs by 1985.

In support of the project, the GRB will contribute the equivalent of \$1.1 million. The Irish Government is also planning substantial technical assistance and training support. The proposed AID inputs total \$8.0 million and are explained in Section II.B.4.

The project will be implemented by ONATOUR, the National Office for Peat, a parastatal organization falling under the jurisdiction of the Ministry of Mines and Energy. The General Development Office (AID/Burundi) will be responsible for coordinating AID inputs and monitoring the project. Although substantial AID resources will be required to properly backstop this project, no unusual implementation problems are anticipated.

## B. Summary Findings

The analyses undertaken in this Project Paper found the proposed design to be technically, financially, economically and socially feasible, and environmentally sound, and concluded that the project is ready for implementation. The Government of Burundi has indicated very substantial interest in the project and has made a written request to AID for support of its initiatives in

this sector. (See Annex A, Exhibit 2).

C. Recommendations

Authorization of a grant of \$8,000,000 over a five-year period for the Alternative Energy-Peat II Project subject to the following waivers: 1/

1. FAA Section 110(a) Waiver for 25 percent contribution to total project costs by a participating RLDC.
2. Services Procurement Nationality Waiver from AID Geographic Code 941 (Selected Free World) to Geographic Code 935 (Special Free World), and for a waiver to permit non-competitive solicitation of services from Bord na Mona, the Irish parastatal peat organization, for up to nine peat specialists.
3. Services Procurement Nationality Waiver from Geographic Code 941 to Code 935 and a waiver to permit non-competitive procurement of services from one individual.
4. Commodity Procurement Source Waiver from Geographic Code 941 to Geographic Code 899 (Free World) for the procurement of 45 semi-automatic macerating machines.
5. Vehicle Procurement Source and Origin Waiver from AID Geographic Code 000 (United States) to Geographic Code 935 for the procurement of 9 vehicles, 1 truck, 1 portable van and spare parts.

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1/ See Annex A for justification

Project Design Team

Laurence Hausman, Design Officer (REDSO)  
Dan Scarfo, Design Officer/Financial Analyst (REDSO)  
Judy Bryson, Economist (Contract)  
James Martin, Industrial Engineer (Contract)  
Joshua Walton, Management Advisor (Contract)  
Herb Blank, Engineer (REDSO)  
John Gaudet, Ecologist (Contract)  
Carolyn Barnes, Sociologist (REDSO)  
Ed Spriggs, Legal Advisor (REDSO)  
Marg Lewis, Financial Analyst (EAAC)  
Tom Lofgren, Design Officer (REDSO)  
Curtis Andersen, Environmentalist (REDSO)  
John Lewis, Commodity Procurement (REDSO)  
Jim Anderson, Contracts Officer (REDSO)  
AID/Burundi Advisory/Review Team

Terry Lambacher, AAO/Burundi  
William Egan, General Development Officer

Reviewed at REDSO Project Review Meeting,  
July 14, 1980, chaired by Alexander R. Love

## II. PROJECT DESCRIPTION

### A. BACKGROUND AND JUSTIFICATION

#### 1. The Setting and The Problem

The situation in Burundi -- its limited land area, its densely settled population (95 percent rural) and the active competition for land use between food and fuel requirements poses very serious implications for the future development of the country. While the problems of obtaining adequate food for the nation's population are paramount, the related problem of ensuring sufficient supplies of energy for cooking and heating is almost equally acute. It is the latter problem that this project proposes to address.

Perhaps even more important than a fuel source is the longer term role of woodlands in regulating water flow and protecting downstream areas by reducing soil erosion and degradation in the upper reaches of watersheds and along the steeper slopes. Burundi's forests are having a decreasing opportunity to play this beneficial role. Although these effects are much less dramatic than the looming energy crisis, they are ultimately far more critical to the protection of the ecosystem. The project will impact favorably on this problem as well.

As in the majority of LDC nations, Burundi's population relies almost exclusively on firewood as the traditional fuel for both cooking and heating, except in the small urban sector where charcoal is the preferred fuel. However, the forests on which Burundi is so dependent are under heavy pressure and tree cover in most parts of the country is steadily decreasing, with attendant negative effects on the environment. There is simply no basis for optimism concerning short or medium-term energy prospects in Burundi. The seriousness of this issue is highlighted in a recent World Bank report, as the following excerpt makes clear:

"Burundi's forest resources are dwindling rapidly. Both natural and man-made forests are being cut down faster than they are being replaced and production is far below the population's minimal requirements for fuel wood and building timber. The urban population is directly affected by the wood shortage, as prices of charcoal increase rapidly and periodic shortages occur. The prognosis for the future is a speedy aggravation of these problems compounded by increases in population and



reductions in total forested areas. This is likely to lead to a severe energy crisis and, unless remedial action is taken rapidly, charcoal and wood would simply no longer be available.<sup>1/</sup>

If the energy needs of all of its wood users are to be met without destroying the environment, Burundi must make maximum use of the energy resources it has available. An intensive tree planting program is underway but it will have no major effect upon fuel availabilities over the next five to eight years, given the time necessary for trees to reach exploitable size. In the meantime, the problem is so acute and the time frame for remedial action so short that other options must also be examined. Unfortunately, Burundi has no known fossil fuel alternatives to wood, such as coal, oil or natural gas. Hydropower potential does exist, although its conversion to a generally available energy source would be very costly. "Of the possible known alternatives to wood as a source of energy, only one, peat, seems at present to be a realistic option. Solar technology is in its infancy and imported petroleum products would in general be prohibitively expensive."<sup>2/</sup>

Fortunately, Burundi does have large reserves of peat, although not nearly as extensive or readily accessible as earlier reports led interested parties to believe. Estimates have varied considerably, and even the World Bank has been guilty of overestimation, including a figure of 500 million tons in their forestry project report.<sup>3/</sup> An Irish advisory team did a peat survey in late 1979 and provided more realistic data of what reserves are currently available for commercial exploitation. While the survey concentrated on highland bogs, it touched on all peat reserves. The major reserves lie in an area known as the Grand Marais, a riverine basin (the Akagera) in the north of the country that parallels the border with Rwanda. Members of the team have estimated the reserves of the Grand Marais to be well in excess of 100 million tons, perhaps as much as 200 million tons. However, the area is flooded or swampy much of the year and existing peat extraction technology would have to be modified to permit any major exploitation of

<sup>1/</sup> World Bank Report, Burundi: Forestry Project, May 14, 1979, pp. 8-9.  
<sup>2/</sup> World Bank, Burundi: Forestry Project, Staff Appraisal Report, p. 13. Underlining supplied.  
<sup>3/</sup> Ibid.

this resource. Although the Grand Marais will eventually be able to supply all of Burundi's energy requirements for at least a century, such action is, optimistically, several years away. For the present, the country must look to its highland peat bogs, small deposits in swampy valley bottoms in the mountainous regions of the Zaire-Nile divide. Current estimates of the six most promising bog sites surveyed by the Irish team indicate firm reserves of just over one million tons (see Technical Analysis, III.C., for a detailed discussion of peat reserves).

This figure is very much lower than the 28 million tons used in the 1969 UNIDO study (Ruston) and about half the figure mentioned in the Peat II PID. Still, for a country with limited alternatives, it is a significant amount. More importantly, it is adequate to develop the infrastructural base (institutional, technical and marketing) that is necessary to properly exploit the much larger reserves of the Grand Marais in the future.

## 2. The Burundian Government Response

The GRB has become increasingly concerned with the problems facing the country in the energy sector. This is evidenced in public statements by senior government officials and in the 1978 Five Year Plan, which included three long-term objectives in the discussion of the energy sector.

- Supply energy to the rural areas;
- Reduce dependence on exterior sources;
- Supply inexpensive energy for industrial and artisanal activities.

Although the intent is admirable, the means for reaching these objectives are not clear. Planned sector expenditures during the plan period are approximately \$60 million, although less than one percent will be directed at alternative energy. The GRB will be looking to donors to provide the bulk of proposed capital expenditures in this area.

To help counter one problem, the Government has enlisted the aid of several donors in undertaking a major reforestation program. If successfully implemented, this program will significantly reduce pressure on the remaining forest cover; however, it should not be seen as a permanent solution. In an already

densely settled country, the future competition for land use is only likely to grow more fierce.

With respect to peat, the GRB created and capitalized the National Office for Peat (ONATOUR) in 1977, a state monopoly with control over all phases of peat harvesting and marketing. In December 1979, the Government combined two separate ministries into a more powerful Ministry of Energy and Mines, which includes peat development among its programs. These two actions have given peat activities a strong, initial impetus. In addition, the operating Ministry is agreeable to reorganizing ONATOUR to enhance its effectiveness. The Mission believes that strong GRB interest in this project is being evidenced.

### 3. Other Donor Interventions

Several recent donor efforts have been aimed at assisting the GRB to discover the extent of and to help develop its peat deposits. Principal among these have been those financed by AID, the Irish Government and by EEC/FED.

The Irish Government (GRI) financed a 1979 survey of Burundi's peat resources and has also been providing the following types of assistance: continued survey work on peat bogs on as an needed basis; short-term advisory assistance to ONATOUR; and, training for Burundian nationals in Ireland. A preliminary survey of the Grand Marais was also completed with the objective of determining appropriate peat harvesting technology. Additional GRI assistance will be forthcoming and is explained in Section II.B.4.

The EEC/FED has been active for over two years in the development of the bog site near Kigozi. The objective of this assistance is to develop a long-term energy source for two tea factories being constructed as part of a larger FED-financed commercial crop development scheme. The EEC and ONATOUR have signed an agreement which commits ONATOUR to supply the tea factories with 4,600 tons of peat per annum for a 20 year period at favorable prices; this is in return for EEC assistance in developing the Kigozi bog for commercial use and other considerations. EEC assistance will terminate in December 1980, and the bog turned over to ONATOUR for further development.

In addition to AID, the GRI and the EEC/FED, the Finnish Government and DANIDA have also been providing Burundi with survey assistance. The Finnish Government has completed the first phase of a three phase effort aimed at surveying and testing the peat

in the Grand Marais for briquetting potential. If successful, this may lead to larger investments (including a briquette factory) in the future. DANIDA, the Danish foreign assistance arm, is concentrating its survey work on smaller highland bogs away from the Grand Marais. The results of both these efforts will be extremely useful to the GRB and ONATOUR in planning and scheduling future peat exploitation efforts. The AID-financed CRS project manager under Peat I is monitoring all peat-related donor assistance.

#### 4. The AID Response

##### a. USAID/Burundi Energy Strategy

At an early date, AID/Burundi has recognized the constraints on Burundi's development that a lack of suitable energy would create. The initial response was Peat I in 1978 (discussed in the following section). The 1981 CDSS followed, with several references to the urgent need for developing alternative energy sources, such as peat, to supplement existing forestry resources and to aid in soil conservation. This was expanded in the 1982 CDSS, which suggests a concentration of U.S. assistance to help the rural population cope with a deteriorating environment by preventing further deterioration of land used for food production. The proposed project is directly responsive to these concerns.

The other elements of this strategy include (1) the Bururi Forest project (proposed for FY 81 financing), which would help to preserve one of the two remaining high altitude tropical forests in Burundi by developing substitute sources of wood for cooking and construction, and (2) the Land Use and Resource Analysis project (proposed for FY 80-81 funding), which will develop a GRB capacity to survey, analyze and monitor land resources, including forests and peat bogs, by producing a land use and resource data base for the country.

##### b. Alternative Energy - Peat I (698-0410.09)

In August 1978, AID and the GRB signed a Grant Agreement for \$490,000 under the Accelerated Impact Program, Alternative Energy: Peat I Project, to be implemented by CRS. The purposes of the project are: to assist ONATOUR to develop Burundi's peat reserves for non-industrial thermal energy requirements; and to develop and design alternative approaches

to encourage rural house hold consumption of peat as a thermal energy source. The project's outputs are to include:

- (1) Establishment of efficient management, personnel recruitment and financial control systems at ONATOUR;
- (2) Production and marketing of 30,000 tons of peat during the two year life of the project;
- (3) Availability of peat to rural consumers at low selling prices; and
- (4) Availability of appropriate research and technology data and analysis.

To carry out this work, CRS installed a project manager/ advisor in ONATOUR and recruited two Irish bog foremen to develop the two project bogs. Several studies have been completed on marketing, economic feasibility and organization, and a sociological survey analyzing cooking habits and preferences is being carried out presently. Development of a low-cost stove/cooker was also recently initiated.

After almost two years, the Peat I project is nearing completion without having accomplished several of its objectives. The January 1980 evaluation of the project highlighted most of these shortcomings. In essence, the original project objectives were far too ambitious for the two year time frame. It has become readily apparent that the process of building ONATOUR into a strong management structure and also of developing a production technology for harvesting 30,000 tons of peat fuel by the end of the second year are much more formidable tasks than was originally foreseen. Furthermore, the original concept of developing a market among the rural populace, who have neither a need for nor means with which to buy a purchased fuel, was based on unjustified assumptions.

Although steps have been taken to strengthen ONATOUR's management capabilities, progress has been limited (see Section III.F., Institutional Assessment). Additional technical assistance (particularly in finance and marketing), and for longer periods of time, is required to improve ONATOUR's performance. Secondly, the technical problems encountered in peat handling, i.e. excessive crumbling, have not been fully resolved. Experiments without any maceration (which is the process of mixing and compacting raw peat), with hand maceration

and with bicycle-powered maceration have shown that some form of machine maceration is necessary. This is due to the lower quality, more fibrous nature of Burundian peat (see Section III.C., Technical Analysis). Machines which should have been field-tested during the current harvesting season were unfortunately not procured. These must be purchased and tested as soon as possible under the Peat II project.

Implementation of Peat I also has had to make adjustments because of two major, critical assumptions in the original PP, namely, first, that "the target group of this activity is 98% of Burundi's population -- the rural poor," and second, that a ready demand for peat exists in the urban domestic consumer, institutional, artisanal and industrial markets for up to 130,000 tons/annum. Both of these assumptions turned out to be patently incorrect.

With regard to the "target group," the rural majority do not have the ready cash to buy peat and do not, as yet, have so limited a supply of wood, dung and agricultural residue as to force them into purchases of a new and strange source of energy. As reported by the CRS Project Manager (June 1980), "During the project, it was found that the only direct benefits to the rural poor were the employment of several hundred day-laborers on the worksites and the marginal increase in their supply of wood fuel..." consequently, without substantial, long-term subsidies, the rural poor cannot realistically be considered a market.

The second inaccurate assumption deals with market demand. The studies on which demand was based were purely theoretical and assumed 100 percent conversion from other fuels to peat. Until the CRS-financed report by I. Pattinson on peat marketing in Burundi (May 1980), no accurate market research was undertaken. That report analyzed ONATOUR's marketing operation and proposes a marketing plan for the future. Although peat production has increased from 1500 tons in 1978, ONATOUR's first full year of operation, to over 5000 tons projected for 1980, the major consumer (80 percent) is institutional, i.e. the army garrisons around Bujumbura. Some effort to interest commercial/artisanal users has been made, with limited success, but the urban domestic market has not been a focused target. Clearly, a more sustained, broad-based marketing effort is called for.

Peat I was the first significant step in a longer term process of developing the country's peat resources. In retrospect,

the accomplishments proposed for the two year project were unrealistic, although they have provided a yardstick against which future objectives can be measured. However, the experimentation begun under Peat I must logically continue. Valuable lessons have been learned from this pilot activity, lessons which have been incorporated into the design of the proposed Peat II project. The increasingly serious energy dilemma in which Burundi finds itself argues strongly that the peat development process must be accelerated; the follow-on Peat II project proposes to do this.

c. Comparison of Proposal with PID

The project as developed in this paper is essentially the same as that proposed in the PID. Except for minor stylistic changes the goal and purpose are the same. With minor adjustments the outputs are the same: production is now expected to reach 47,500 tons of peat per annum by 1985 vs. 44,900 tons; there will be a greater emphasis on sales to the urban domestic market, principally in Bujumbura; and, although some funds are included for hand tools used in small bog development, and ONATOUR will offer assistance, upon request, this element will not be stressed. The design team determined that it would require a disproportionate effort by ONATOUR. Consequently, AID/Burundi has begun to solicit expressions of interest from a PVO willing to undertake the activity. In that manner, the activity can be properly tested and at some point included in ONATOUR's larger program, if proven successful.

The more significant changes involve project inputs. The AID contribution is now \$8.0 million vs. \$5.3 million, and the PL-480 component (\$3.3 million) was dropped. The increase is largely accounted for by additional technical assistance, which Peat I experience has shown is absolutely essential. In addition, modest, new offices for ONATOUR are to be constructed. With regard to PL-480, which was to have been used as a salary supplement for bog workers, the design team and the outgoing CRS project manager have agreed that the proposed salary structure for bog workers is fully adequate.

The contribution of the GRB, which was shown as \$3 million in the PID, is now approximately \$1.1 million. This amount more accurately reflects GRB inputs for two reasons: it offsets ONATOUR's expenses by revenues from peat sales, and it does not attempt to place a value on the peat bogs. Thus, the GRB contribution is entirely financial.

## B. DETAILED PROJECT DESCRIPTION

### 1. Goal and Purpose

The goal towards which this project is directed is to maximize the effective utilization of Burundi's limited energy resources. The project will contribute toward the realization of this objective by helping to develop an energy resource--peat--which Burundi has only just begun to use in any significant fashion.

The purposes of the project are twofold: first, to conserve the country's forestry reserves by increasing the availability and acceptability of peat as an alternative energy source; second, to strengthen the institutional capacity of ONATOUR to carry out present and planned operations on an efficient basis and without need for significant future financial or technical support. By increasing the amounts of peat commercially available and, concurrently, by stimulating the demand for its use, and increasing share of the markets that buy solid fuel (principally urban domestic, institutional, artisanal/commercial and industrial) can be converted to peat. This would reduce pressure on the country's rapidly depleting forests, which provide the fuel source for the overwhelming majority of the population. To aid in accomplishing this objective, it is important to strengthen the GRB institution responsible for the production of peat. The development of a properly functioning, financially viable ONATOUR is a necessary condition for the proper execution of this project as well as for following through on all future activities.

### 2. Project Strategy and Overview

#### a. Burundi's Energy Dilemma

The proposed project is a response to GRB requests for AID assistance in solving its solid fuel energy problems. The dilemma confronting the Burundian Government is how to protect its limited renewable energy resources (wood), upon which the vast majority of its population depends, until such time as the current afforestation efforts produce enough timber to at least equal the nation's consumption of wood. The options are extremely limited. The most attractive of these is to develop and encourage use of an available non-renewable energy resource-peat. However, current proven reserves of peat indicate that this can only be a partial answer. Nonetheless,



the manner in which peat substitutes for wood can greatly enhance its efficiency. During the analytical work of the design team, it became evident that the substitution of peat for charcoal is clearly the preferred usage.

Charcoal is a wasteful use of wood; the conversion process requires seven units of raw wood to obtain one unit of charcoal. Although charcoal does have a higher heating value, i.e. kilo-calorie (KCal) output--7,200 (charcoal) vs. 4,000 -- (wood) the loss of energy in conversion is very significant. Meanwhile, peat has a KCal value of only 2,500-2,900, putting it at a slight disadvantage vis a vis both wood and charcoal. Nonetheless, it is an underutilized resource that can compete with both of those other solid fuels. If peat substitutes for purchased wood, 100 tons of peat will have the equivalent KCal value of approximately 11 hectares of cropped forest or 2.28 hectares of clear cut forest. If peat substitutes for charcoal, 100 tons of peat will have a KCal equivalent of 56 hectares of cropped forest or 11.5 hectares of clear cut forest. The latter substitution is clearly more efficient.

#### Target Group Rationale

On the assumption that the foregoing analysis is reasonably accurate (see Economic Analysis, Section III.A), the urban domestic market, which is heavily concentrated in Bujumbura, is the logical primary target group. The project is structured to support that analysis and substantial inputs have been included for marketing activities. Assuming that the obstacles (both real and perceived) to large-scale conversion to peat can be overcome, the project proposes to capture up to 60 percent of the Bujumbura domestic market by the end of the project. Given the rapidly escalating costs of charcoal and the decreasing net amounts of forest cover, particularly in the areas around the capital, the cooking/heating options for the urban poor are indeed limited. Purchases of charcoal will place an increasingly heavy burden on the disposable income of large numbers of poorer urban dwellers. Shifting to gas or paraffin/kerosene appears prohibitive, leaving wood and peat as alternatives. However, since wood is subject to the same scarcity factors as charcoal, peat remains the most logical fuel. The market price of peat will be about 10 percent lower than the equivalent cost of charcoal in 1981. This price difference will widen dramatically, in favor of peat, by 1985. Therefore, given the consumers' financial incentive, the project target of converting 60 percent of Bujumbura households to peat appears realistic.

Although the importance of the urban domestic market is unchallenged, for reasons cited above, there are other markets which will account for the bulk of peat sales during the initial years. These include the artisanal/commercial (bakeries, brick manufacture, lime kilns), institutional (armed forces, hospitals, missions), and industrial (tea factories) markets. Assured sales will be those to the Burundi Army and to two FED-financed tea factories.

The project envisions using the existing transport-wholesale-retail marketing chain for charcoal and wood to the maximum extent possible. This will minimize the expense to ONATOUR and to the consumer and will reduce the uncertainty of developing new marketing links. On that assumption, the design team has determined not to finance a separate transport fleet for ONATOUR and, instead, will encourage it to maximize on-site sales. This will effectively limit ONATOUR to a "wholesale production" operation; however, in light of the marketing tasks it faces, e.g. in the Bujumbura domestic market and among other potential clients, it will be a sufficiently significant achievement if that is done well. If these assumptions do not hold, however, a reassessment will be necessary. For a more complete discussion of marketing, see the Technical Feasibility section (III.C.).

c. Implementing Institution - ONATOUR

Although the project will respond to the country's energy problems, it is evident that those problems cannot be addressed without simultaneously strengthening the implementing GRB institution. As discussed earlier, and in Section III.F. (Institutional Assessment), ONATOUR is yet a fledgling operation. Nonetheless, it faces a number of early, important decisions. Foremost among these is whether it will be run on a business-like basis. At present, ONATOUR is a financial drain on the Burundi Treasury; it is likely to continue to run deficits through 1984. Thereafter, however, it could become a substantial revenue earner. Whether it does so or not is dependent upon whether the GRB gives ONATOUR's management sufficient leeway to make decisions along sound management lines. The design team discussed a proposed "operating philosophy" with the Minister of Mines and Energy and received his concurrence on the basic principal, i.e. that ONATOUR's operations will be guided by sound business practices. This operating philosophy, which is an essential condition for AID participation, will be formalized in the Project Agreement.

d. Phased AID Assistance

Both the design team and AID/Burundi strongly believe that the success of the project will depend, in large measure, on several important initiatives expected of the GRB. The most important of these is mentioned in the preceding paragraph - agreement to adopt an operating philosophy for ONATOUR that will permit it to function on a business-like basis. This entails both financial and operational guidelines, which include the following: (1) that ONATOUR will have authority to charge a price for its production that covers its cost of sales and depreciation, with subsidies, if any, to be absorbed by the GRB; (2) independent audits of ONATOUR's financial records; (3) joint agreement on technical advisors and senior ONATOUR staff; (4) establishment of a system of compensation for senior level personnel that is commensurate with their level of skills and experience; and (5) institution of a selection and dismissal system for ONATOUR field and headquarters staff based on merit.

Another initiative of the GRB is its acceptance of the principle that the Government will assume ONATOUR's anticipated operating shortfall until such time as ONATOUR can cover its costs from peat revenues, expected to be 1985. Timely contribution of these funds is necessary to ensure the institution's smooth operation.

Although both of these initiatives will be conditions in the Project Agreement, there is some concern regarding the promptness with which they will be implemented. Changing the operating philosophy of a parastatal organization to be responsive to private sector concerns is not an easy measure. It will entail changing rules and methods of operation that are ingrained in all parastatals and in the GRB. Nonetheless, unless the changes are made and new groundrules introduced in a relatively short period of time, the chances of this project succeeding (as measured by the self-sufficiency criterion that serves as the conceptual underpinning of the project) are highly doubtful.

Similarly, there are technical questions that involve the appropriateness of the proposed peat macerating equipment that must be satisfactorily answered if ONATOUR is to reach the production targets that have been developed. Peat is presently harvested manually, and as a result has encountered extensive breakage and crumbling. To make peat into a more durable, better quality product requires mechanical maceration (mix, compact, extrude). These macerating machines were to have been tested during the current harvesting season under Peat I, but unfortunately were not. The machines appear to be the most appropriate low-level technology available for Burundi that still maximizes labor employment. A key member of the design team, an Irish expert with many years of experience in working with these machines, has vouchsafed for their appropriateness to Burundi's conditions. Nonetheless, considering the potential investment, the design team believes it prudent to field test three such machines during the first two months of the next harvesting season - May to July. Then, if any modifications are required, these can be made before the remaining 42 project-financed machines are ordered.

For these three reasons - implementation of a new operating philosophy at ONATOUR, the timeliness of GRB contributions to ONATOUR's operations, and confirmation of the macerating machine technology - an early review of the project is necessary. July 15, 1981, has been selected for a review by AAO/Burundi, with REDSO assistance, of the status of these specific measures. The project team believes that substantial progress in each of these three areas must be demonstrated. If progress is unsatisfactory, no disbursements shall take place for construction of the ONATOUR office, training or procurement of additional commodities. However, if, as anticipated, satisfactory progress is achieved, it will provide a clear signal of the GRB's intent to make the project succeed, and disbursements will continue as planned. A condition to this effect will be included in the Project Agreement.

e. Project Limitations

In looking at what this project proposes to accomplish, one is struck by the underlying rationale that the purpose of exploiting peat is to 'buy time.' Over the short to medium-term, the project will be helping to buy time for additional trees to grow while peat is substituted (at least partially) for wood and charcoal as a fuel. The more peat can substitute for charcoal, the more effective the project will be, which accounts for the strategy of concentrating marketing efforts on the urban users of charcoal. Over the longer term (and largely with the peat reserves of the Grand Marais), peat will become a major energy resource, albeit non-renewable, with a very significant role to play in the country's energy plans until other forms of energy can be developed.

In the course of design, it became increasingly evident that there is an experimental nature to many aspects of the project. Marketing a new product, especially one that is rather basic to household lifestyle, may be a process fraught with obstacles. Although the production technology is much more certain, a question remains about the adaptability of semi-automatic peat macerating machines to the bog conditions in Burundi. In addition, there are uncertainties regarding other aspects of the project -- ability to link up with the charcoal transport-wholesale-retail chain; concern with ONATOUR staff's acceptance of the proposed operating philosophy; concern for the ability to develop a low-cost cooker/stove, the artisan workshops that will manufacture it and a public willing to purchase it; and most importantly, an uncertainty that price incentive will be sufficient to convert the potential consumers of peat from wood and charcoal.

Nevertheless, upon viewing the country's immediate options, there appear to be no realistic alternative but to make use of this new energy source. Given that overriding factor, the project is designed with sufficient flexibility and enough resources to accomplish its objectives.

### 3. Project Outputs

To achieve the dual project purposes of (a) reducing the depletion rate of Burundi's forest reserves by developing peat as an acceptable alternative energy source and (b) strengthening the institutional capacity of ONATOUR, this project will have to produce the following outputs:

1. Trained ONATOUR Staff: Considerable efforts will be made early in the project to develop a minimum core of trained Burundians for ONATOUR's staff. Given the nature of what is to be learned, most of the training will be on the job in Burundi from both the long-term and short-term advisors. Some specialized technical, financial and marketing training will take place in Ireland and elsewhere.

During the Peat II Project the following types and numbers of ONATOUR personnel will be trained: bog managers (6), mechanics (minimum 4), field surveyors (minimum 4), laboratory technicians (2), accountants (2), and general engineer (1). This will be in addition to the four division chiefs - production, marketing, finance and administration - who will be recruited, presumably having many basic skills, but whose skills will be upgraded by working closely with the project advisors. The same holds true for the Director and Deputy Director of ONATOUR.

2. Improved ONATOUR Management Capability: The successful training of Burundian counterpart staff is key to the improvement of ONATOUR's management capability. However, to ensure that ONATOUR is put on a sound, business-like footing, in the first two to three years of this project the experts provided under the project will assume direct line responsibility for certain key positions (these are described in the following section). Thereafter, they will revert to advisory roles and will work with their trained and motivated Burundian counterparts. Those areas where ONATOUR needs significant strengthening are: financial management (both general and cost accounting), marketing, bog-site production, laboratory control, prospecting, and equipment maintenance.

3. Resolution of Technical Questions: Generally, most if not all technical questions are resolved before embarking on a new project. In the case of Peat II, however, two technical questions -- one concerning production methods and the other centering on household use of peat -- will have to be answered during the implementation of the project. The macerating machinery question is discussed in the previous section and in the Technical Analysis. Selection of the most appropriate type of cooker/stoves for household use of peat will take somewhat longer than selection

of the best production methods. The project designers anticipate it will be 1982 before sufficient design, testing, demonstration, and household response can take place to identify the most suitable stove model(s) for urban and rural use. Work has already begun under Peat I on stove design and testing. Over the next two to three years experimentation in Burundian homes will lead to the development of efficient, inexpensive peat burning stoves which will be manufactured locally.

The project design has been structured to ensure resolution of the technical questions regarding both production methodology and development of the best types(s) of cooker/stoves. Once these questions are satisfactorily answered, one of the most important project outputs will have been achieved.

4. Development of Commercial Bogs: Project output targets for peat production are specific: By the end of 1983, six commercial bogs will be producing peat for the commercial markets. In tonnage terms, the project calls for an annual production level of 47,500 metric tons by 1986 and 57,000 MT when all Burundi's commercially exploitable bogs are in full production.

Once the outputs identified above have become reality, the end-of-project status indicators for Peat II should be attainable. These are: (1) The net drawdown of Burundi's forestry reserves will have been significantly slowed; (2) ONATOUR will have greatly strengthened its internal operations, will possess a trained staff, and will be in a financially sound position and able to cover its operating costs; (3) Annual peat production will increase to 47,500 MT by the project's completion, at which time approximately 60% of Bujumbura's urban domestic market will be using peat.

#### 4. Project Inputs

To obtain the end of project results mentioned above and to have ONATOUR headed toward financial and technical self-sufficiency will require substantial inputs, principally from AID and the GRB, but also from the Irish Government. In order of financial importance, the source of these inputs is:

a. AID. The proposed AID inputs total \$8.0 million and consist of the following components:

(1) Technical Assistance (\$4,602,000). This includes services for both long-term and short-term assistance (See Annex H). The long-term assistance is broken down into a headquarters team and a field production/maintenance staff. The headquarters team is made up of three professionals: a financial expert, a marketing expert and a general engineer.

To ensure that an expanding ONATOUR will be adequately staffed at key management levels, the finance and marketing specialists will operate in positions having direct line authority; they each will have the title of sub-director of ONATOUR. Consequently, in addition to advising and working closely with the ONATOUR Director and Deputy Director on planning and management of operations, the financial expert will be responsible for the proper functioning of the finance and administration divisions, and the marketing expert will be similarly involved with the marketing and production divisions. They will assume those responsibilities for the periods during which they are training Burundian counterpart division chiefs. These periods will vary, although an estimate of 2-3 years appears realistic. Thereafter, they will pass operating responsibilities to their counterparts and will assume advisory positions for an additional 1-2 year period. The terms of their contracts will be 4 years each (see Position Description, Annex H)<sup>1/</sup>. Depending upon qualifications and experience, one of the two will be selected as chief of party.

The general engineering advisor, preferably having prior peat-related experience, will assist the production division chief in field matters, supervise the construction of the ONATOUR office and all bog site works, develop bog drainage plans and be responsible for laboratory sampling. He will also be expected to train a counterpart engineer to assume his responsibilities. The proposed length of contract is 2 years.

The second element of long-term assistance is the field production/maintenance staff. This includes bog site

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<sup>1/</sup> It is likely that the current CRS-funded project manager for Peat I may be recruited for the marketing specialist position.



supervisor and mechanics. These specialists will be responsible for managing all site-related activities. The bog supervisors will each be assigned to one or two bogs and will organize production workers and machinery use, direct peat cutting and drainage work, supervise drying and storing, and handle all on-site peat sales. A total of 4 supervisors will be required for 14 person-years. The project requirements are: 3 supervisors-Year 1; 4-Years 2 and 3; 3-Year 4. The mechanics will rotate among the project bogs, handling preventive and corrective maintenance on up to 25 macerating machines each. The requirement is for two mechanics for up to 7 person-years. A major task of both groups will be the training of counterpart staff. It is anticipated that once these technicians depart they will have left behind a cadre of fully qualified ONATOUR personnel capable of managing all bog site operations, including operation and maintenance of machinery.

In response to anticipated requirements for specialist services, a total of up to 36 months of short-term assistance (\$206,000) is proposed. This includes advisors in industrial engineering (3 months), mechanical engineering (3 months), consumer marketing (3 months), social analysis (3 months), stove design/construction (up to 18 months) and unprogrammed (6 months).

It is anticipated that these services will be used in the following manner: the industrial engineer shall have great familiarity with all aspects of peat production and will be available for short periods during the first three years to provide 'troubleshooter' advice on the full range of technical issues (production, equipment, bog drainage, etc.). The mechanical engineer shall be an expert on semi-automatic macerator design and operation and will work with the initial group of three test machines in 1981 to evaluate their efficiency and adaptability to Burundi's bogs. He will design any necessary modification. It is very likely this expert will be associated with the manufacturer, and that his services may be a condition of awarding the contract for machinery. A consumer marketing specialist, experienced new product development in developing countries, is necessary to develop a detailed marketing and publicity plan for introducing peat into the Bujumbura market. He/she will work closely with the long-term marketing advisor in properly phasing the operation. Also, a social analyst, with experience in Burundi/Central Africa, is required to follow-up on baseline studies currently being conducted under the Peat I project. This

is particularly important because a continuing concern of the project will be to accurately gauge and feed back information on the attitudes of peat users and non-users in both the urban and rural project areas. The stove design/construction engineer (Burundi resident) will be engaged in stove design and modification, and will also provide training to artisanal manufacturers of stoves and cookers. He will work principally in Bujumbura, but also on cooker adaptation for the rural areas. An engineer currently working on low-cost stove design has already been tentatively identified.

(2) Equipment and Vehicles (\$1,662,000). To provide ONATOUR with the means for increasing peat production to desired levels and also to enable its staff to function under more acceptable working conditions, the following commodities will be procured -- 45 macerating machines, 9 pick-ups, 1 10-ton truck, 1 Portavan, tools and equipment for bog-sites, offices and laboratory, and furniture for offices and TA housing. See Annex A for a proposed vehicle waiver; Annex B contains detailed commodity lists.

Procurement of an eventual total of 45 macerating machines will be confirmed after July 15, 1981, when tests on three trial machines for appropriateness and adaptability will have been completed. The technical specialist on the design team is familiar with the capability of the machines and is certain that semi-automatic macerators, the simplest and most appropriate mechanical method of maceration, i.e. compaction and extrusion, will be well suited to conditions in Burundi (see Technical Feasibility, III.C. and Annex C). To confirm this judgment and to observe their operation under local conditions, three macerators will be tested during the first 10 weeks of the 1981 peat harvest. Assuming no problems are encountered or that if problems are discovered they can be overcome, the remaining machines will be procured according to schedule (17 for 1982, 10 for 1983, 7 for 1984, 8 for 1985).

Since some of the bog sites are as much as 125 km. from Bujumbura, lack of transport would be critical constraint to effective monitoring and supervision. Vehicles (9 pick-ups, 1 10-ton truck and 1 Portavan) are necessary to augment ONATOUR's existing, small fleet and to provide both AID-funded technicians and key ONATOUR staff with mobility. Eventual replacement of these vehicles will be the responsibility of ONATOUR.

Tools and equipment for outfitting bog labourers at each of the 6 bog sites and for maintaining the macerating machines is required.\* AID will finance the initial supply of these items; however, ONATOUR will be responsible for their replacement, and these costs have been incorporated into ONATOUR's operating budget. Similarly, modest amounts of office and laboratory equipment will be provided to supplement existing items and to give ONATOUR staff the wherewithal for carrying out its administrative/technical functions. Replacement of these items will be the responsibility of ONATOUR. Lastly, office furniture and residential furniture (for all AID-funded technicians) will be provided. Again, the AID input will supplement existing ONATOUR office furniture.

(3) Demonstration/Publicity (\$100,000). Although funds for this activity are limited, their impact on increasing conversion from charcoal to peat is expected to have great significance. Indeed, effectively stimulating the demand for peat among urban domestic consumers will do more to enhance the success of the project than any other single activity. Funds for this program will be used at the discretion of the long-term marketing expert and will support recommendations of the consumer marketing advisor and the sociologist. Although the financing of certain activities have been tentatively identified, the actual expenditure of funds and the mix of promotional activities will be determined during the course of the project.

The activities tentatively identified include procurement of up to 1,000 low cost, locally designed and manufactured peat burning stoves; demonstrations of peat as a cooking fuel in selected residential areas of Bujumbura and other population centers; sample testing of peat use among volunteer participants; radio and poster advertising to promote the use of peat; and, selective subsidization of peat among potential institutional and artisanal clients. Some very tentative steps were taken along these lines in the Peat I project; this effort will be greatly expanded under Peat II. For additional discussion of marketing, see the Technical Feasibility, Section III.C.

(4) Training (\$110,000). The project will stress on-the-job training for the majority of counterpart staff. To that end, a very substantial technical assistance component is included. Furthermore, much of the prospective training lends itself to conditions and practices specific to Burundi. However, the project does also anticipate that certain short-term and medium-term training in technical and, to a lesser degree,

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\*Up to \$10,000 of tools for laborers involved in small bog development is included.

administrative/financial skills will be required. A total of 24 months of third country training is included. For technical training (peat analysis, drainage and reclamation, mechanics), arrangements with the Irish Peat Board (Bord na Mona) or possibly the peat boards of Finland, Germany, Denmark or Netherlands will be concluded. For administrative/financial training (management, accounting, marketing), course work and institutional visits to U.S. or other African nations is envisaged. The technical assistance team, with assistance from the Mission and AID's office of Training, are expected to identify participants and training opportunities.

(5) Construction (\$260,000). The headquarters facilities of ONATOUR are wholly inadequate for an expanded program. Although the site is adequate, the buildings are in poor condition and space is extremely limited. Recognizing this, the GRB has set aside funds to purchase the site for new offices and AID proposes to finance their construction. A modest construction effort is intended. See Engineering Analysis, Section III.E.

(6) Other Costs (\$453,000). Principal among these costs is the rental of housing for the technical assistance team in Bujumbura and near the bog sites (\$292,000). In addition, during the period in which the ONATOUR offices are being built, it will be necessary to rent temporary office quarters (\$60,000). Lastly, the project proposes to finance the first year POL costs of the three test macerating machines (thereafter all operating costs will be born by ONATOUR) as well as the POL requirements of the 9 project-financed pick-ups (\$101,000), which will be principally used by the technical assistance team.

b. Project Inputs-Government of Burundi

The Burundian Government is prepared to support this project with a local currency contribution equal to \$1,089,000 million, or 11 percent of total project costs. The contribution is made up of the following two components: an equity contribution to help recapitalize support for ONATOUR's operating shortfall (anticipated for the period 1980-84) and the purchase of land for ONATOUR's offices. An inflation factor was incorporated into the support costs.

ONATOUR has operated at a deficit since its inception in 1977. This deficit is expected to continue through 1984. The GRB will fund the operating shortfall, estimated to total \$1,011,000

equivalent, during the 1980-85 period. Included in the amount are the added costs of staff increases, running costs for the macerating machines, provision of housing for field staff, depreciation and equipment replacement costs, increased utility and maintenance costs and higher office operating expenses. ONATOUR's projected profit and loss position can be found in Annex E, Exhibit 1. The GRB will also provide the land for the new ONATOUR offices and has recently assigned funds (\$78,000) to ONATOUR to initiate purchase arrangements.

The GRB is also making or planning to make available certain contributions which are difficult to value and have consequently not been incorporated into the above. These include the land value of the 6 bog sites, access to radio broadcasts and the costs of moving ONATOUR into temporary quarters and back again once the new offices are completed. After examining the extent of the GRB commitment, both implied and actual, the design team concluded that the proposed GRB contribution is adequate, although it does not total 25 percent of project costs. Since Burundi is included on the list of RLDC nations, a waiver request of FAA Section 110(a) provisions is included in Annex A.

#### c. Other Donor Inputs

The Government of Ireland (GRI), through its National Peat Board (Bord na Mona), is providing assistance to Burundi to fund several activities, including (1) the training of ONATOUR and Ministry of Mines and Energy staff in Ireland in prospecting and peat analysis techniques; (2) a survey of Burundi's highland bog peat reserves; (3) technical services to study the feasibility of developing a peat briquetting factory in Burundi. These items will entail a GRI contribution of an estimated \$245,000 during 1979-81. In addition, the AAO/Burundi has received verbal assurances from the Irish Foreign Office of its intent to provide an additional \$1.2 million in support of this program. Clarification of the timing and make-up of this assistance is expected shortly. Among the elements under consideration is the provision of Bord na Mona technical assistance and training. Aid in testing the production potential of the Grand Marais is also a possibility.

The World Bank is developing a low-cost housing scheme for approximately 1000 families on the outskirts of Bujumbura. Included in that program is a technical assistance component (\$35,000) to develop and test a more efficient, low-cost wood burning stove than is currently in use. Discussions

have been held with the World Bank country representative about the AID project objectives, and general agreement was reached on modifying the scope of work of the World Bank consultant to include (or perhaps concentrate on) research into an appropriate, low-cost peat-fired stove/cooker. Care will be taken to coordinate this effort with the stove development work of the AID-financed local engineer. If additional support or assistance is necessary to develop an adequate technical response, short-term AID TA funds will be made available.

In addition to the GRI and World Bank, the Finnish Government began work early this year with Ministry of Mines and Energy personnel on initial exploration and test sampling of peat in the Grand Marais. The design team was advised that second stage plans include a larger sampling and testing program as a prelude to a possible third phase establishment of a commercial peat processing facility (probably briquetting). Furthermore, although the EEC has apparently decided to end its support for highland peat bog development by December 1980, the team was informally advised that the community's commercial overseas arm, the European Investment Bank, is prepared to invest in a similar peat briquetting plant near the Grand Marais. In either event, donor interest is very keen for developing the potentially much greater, and commercially more attractive reserves of the Grand Marais.

## 5. Project Beneficiaries

### a. Direct Beneficiaries

Three groups of beneficiaries are expected to benefit directly from the project: users of peat, the labor force on the bogs and artisanal manufacturers of stoves and cookers.

Among the expected users of peat, the urban household population in Bujumbura will be numerically the largest beneficiary group. By 1985, an estimated 60 percent of the city's projected 193,000 population (or approximately 115,000 persons) will be using peat as their primary or secondary fuel. At present prices, the poorest households spend as much as 20 percent of their income on fuel. With the price of charcoal rising rapidly, a shift to peat, whose costs will rise along a more gradual curve, will entail substantial cost savings. More importantly, from an equity consideration, the poorer population groups that purchase their fuel will have the highest benefit incidence.

Other user groups include the artisanal works that require considerable amounts of fuel: brick and tile makers and lime kilns. Perhaps 20 such operations will shift from wood to peat because of the latter's better heating properties. The potential commercial users include an estimated 6-8 bakeries in Bujumbura and other urban centers, although technical problems add an uncertainty to that estimate.

The other two markets are institutional and industrial, which includes the two tea factories that already have a long-term contract for supplies of peat; <sup>they</sup> will be less inclined to shift to peat because their energy is supplied by wood. The institutional market is likely to include the Burundian Army, the largest current user of peat, and perhaps 10-12 schools, missions and hospitals that are located near the bogs. These markets are better described in the Technical Analysis, III.C. While it is tempting to assign firm numbers to each user group, the uncertainties surrounding the marketing program argue strongly for using only approximate figures.

The next largest beneficiary group is the laborers who will be employed on the bogs. They include both year-round employees and those working only during the 7 month harvest. An estimated 2400 workers will be working on the bogs by 1985, 675 of them full-time. This is more than double the current 1980 work force, 990 workers, of whom 285 are full-term. The net earnings (cumulative) for 1981-85, have been estimated at over

\$700,000. More importantly, these jobs are assured for at least 10 years, and more than 20 years at some bogs. Furthermore, the more qualified bog workers will be selected for semi-skilled positions working with the macerating machinery. Their familiarity with machine operation will enhance their ability to undertake related work.

The smallest beneficiary group includes the artisans, who are expected to manufacture low-cost cooker/stoves for sale to the general population. As a stimulant to production, the project will procure 1000 such stoves for demonstrations and sale. Although tentative interest has been expressed by several artisanal workshops, no clear estimate of numbers has developed; at a minimum, 4 or 5 workshops are expected to become involved in stove manufacture. The number of workers involved is likely to be approximately 50. As in the case of the bog workers, these positions are likely to provide long-term employment.



### III. PROJECT ANALYSES

#### A. ECONOMIC FEASIBILITY

##### 1. Economic Overview

Burundi's economic problems can be summarized by the adjectives which are often used to describe the country: rural, densely populated and land-locked. Ninety-five percent of the population live in rural areas, and the primary sector produces 75% of GDP. Coffee, cotton and tea exports account for between 80-90% of foreign exchange earnings. However, the growth in production in the agriculture sector of 1.6% per annum since 1970 has lagged seriously behind the population growth rate, which nationally averages an estimated 2.2 to 2.6 percent.

By contrast, urban-based domestic production in the secondary and tertiary sectors doubled between 1970 and 1977, and the value added per capita is approximately eight times higher in the urban than the rural sector. Lagging agricultural production derives partially from the high population densities in rural areas (averaging 160 persons/km<sup>2</sup> with a high of 260 persons/km<sup>2</sup> in some areas) and a traditional, largely subsistence agricultural system which cannot cope with the increasing pressure on the land.

Rising coffee prices in the mid-1970s provided the Government of Burundi with greatly increased foreign exchange and budgetary resources to use in addressing these problems. The ambitious Five Year Development Plan for 1978-82 reflected these increased funding availabilities and projected investments of approximately \$751 million (1976 prices) over the five-year period. Of this amount, 20 percent was intended for the rural sector. The planned level of investment was expected to result in a rate of growth in the agriculture sector of 3.4% per annum over the Plan period and an overall average annual growth rate of 5.6% in GDP.

Several circumstances, primarily external to Burundi, have worked against this hopeful program: falling coffee prices, rising petroleum prices and the war in Uganda, which disrupted Burundi's supply lines and restricted the amount of cement and petroleum available in the country during several months in 1979. As a result, the government was forced to revise its planned investment program under the Five Year Plan downward to approximately

\$550 million (1977 prices -- this represents a reduction of 31.6 percent in real terms). During 1979, the growth of production in the primary sector remained at 1.6 percent, the secondary sector registered a drop in production of 5.9 percent (due to shortages of cement and fuel), while the tertiary sector increased by 5.3 percent for an overall growth in GDP of 1.4 percent.

To surmount the barriers to development -- a lagging agricultural sector and dependence on external supplies of basic materials, among others -- Burundi must work to maximize the return from its own resources. For example, building materials, such as cement, bricks and roofing tiles, could be produced locally in greater amounts if the energy resources necessary for their production were available. At present the available energy resources (primarily wood) are severely limited and are competing with food and export crops for the land area necessary for their production. The following sections discuss energy problems in detail and consider the cost/benefit implications of the proposed Peat II Project which represents a contribution to increasing energy availabilities.

## 2. Estimation of Burundi's Energy Needs

The alternatives available to Burundi in meeting current energy needs while preserving the minimum tree cover necessary for environmental protection are essentially peat or imported fuels. A limited amount of energy is available from hydro-electric power (primarily coming from a dam located in Zaire which was commissioned in 1956 by the Belgian colonial government), and Burundi has considerable potential for domestic hydro-electric generation. However, this does not represent a short- or medium-term answer to most energy needs given the time and capital cost involved in constructing dams and a national distribution grid as well as importing consumer appliances.

Wood is the only other domestic energy resource currently available; however, demand for wood has been exceeding the supply available from cropping (as opposed to clear-cutting) forest areas. A generous estimate of current tree cover, 6 percent of land area, indicates an availability of 162,000 hectares of trees. Cropping that area of trees would provide approximately 810,000 MT of wood, which is substantially less than current annual demand. As a result, Burundi's tree cover is being steadily reduced, and this process will accelerate in future years as the population increases and both the area and trees available for cropping are reduced.

The Burundi Government has underway a tree planting program which will partially offset this process. However, without the proposed project, it is estimated that tree cover will be reduced to less than 40 percent of current availabilities by the end of 1986; in any case, new tree plantings will not increase current energy supply as it takes 5 to 8 years for trees to reach exploitable size. It is also important to note the cost of reforestation; the GRB's program to establish 22,000 hectares over the period of the Third Five Year Plan will cost on the order of \$8.8 million, 35% of which is foreign exchange.<sup>1/</sup>

Given these circumstances, the analysis has focused on the ways in which Burundi's peat reserves can be used to protect the maximum amount of trees and thus result in the most efficient use of energy. This analysis indicates that the urban domestic market, which currently burns charcoal, should be the primary target group for conversion to peat. This is so because the process of converting wood to charcoal is highly inefficient -- it requires 7 tons of wood to produce 1 ton of charcoal! (Further details on wood availabilities, usage and analysis of various types of users are contained in the Economic Annex, Exhibit I). Accordingly, the approximately 100,600 MT of peat which will be available for use between 1981 and 1985 (this is somewhat less than total production due to an expected carry-over of approximately 30% of annual production from one year to the next) are planned for use first by the urban domestic market (61,800 tons), with the remaining 38,800 tons going to current wood users.

Used in this way, peat produced under the project will provide the energy equivalent of clear-cutting 8200 hectares of forest (or cropping 40,000 hectares).<sup>2/</sup> As such, this project will make a significant contribution to improving Burundi's current environmental/energy situation, although it represents only a partial solution to the overall shortage of energy supplies.

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<sup>1/</sup> These estimates are based on the amounts budgeted by the World Bank to establish 2000 hectares of eucalyptus plantation -- see World Bank. Burundi Forestry Project, Staff Appraisal Report, May 8, 1979 (Report No. 2376-BU), p. 41.

<sup>2/</sup> These estimates are based on the following assumptions. One hectare forest clear-cut yields 24 MTs of wood, while cropping one hectare yields 5 MT. In terms of KiloCalorie Equivalents, 1 Kilo charcoal=2.48 kilos peat; 1 kilo wood equals 1.8 kilos peat. The conversion process for wood to charcoal requires 7 kilos of wood for every 1 kilo of charcoal.

In addition, however, the project will also help to build the institutional framework for exploiting Burundi's major peat reserve, The Grand Marais, which will have a more important contribution to make to peat energy supplies in future years.

### 3. Supply and Demand Projections

Considerable controversy has arisen with respect to peat in Burundi due to past overestimates of peat reserves in the highland bogs and also of demand for peat. The overestimates (28 million tons as compared to current known reserves of 1,021,000) were based on extrapolation of the results of limited surveys, while demand projections were based on total conversion of all energy users to peat.

Despite these reservations, a recent CRS-conducted analysis of demand for peat indicates that it will exceed supply, provided a vigorous marketing/publicity program is undertaken to convert urban consumers to the use of peat. Recognizing the difficulties this will present, the project budget includes funding for the development of suitable cooking appliances, for publicity and demonstrations, and for both a long-term marketing specialist and short-term consultant assistance in consumer marketing. The following table provides a summary of expected supply and demand of peat by type of market over the five years of the project.

Table 1 : Projected Peat Supply and Demand

Year	<u>Supply</u> (MT 000)	<u>Demand</u>				<u>TOTAL</u> (MT 000)
		<u>Urban Domestic</u> (MT 000)	<u>Institutional</u> (MT 000)	<u>Industrial</u> (MT 000)	<u>Artisanal/Commercial</u> (MT 000)	
1981	10,850	1,800	4,400	2,450	5,400	14,050
1982	18,060	5,800	5,100	4,750	7,700	23,350
1983	27,030	10,100	5,700	7,750	9,000	32,550
1984	35,550	17,100	6,500	7,750	11,500	42,850
1985	44,650	27,000	7,000	5,300	12,800	52,750

Projected urban market demand is based on a planned sales program designed to take over 60% of the urban consumer market by 1985. Institutional, industrial and artisanal demand is based on the market analysis contained in a report by Ian Pattinson, The Development of Peat Marketing in Burundi, ONATOUR, May 1980. There have been some upward adjustments in the Pattinson estimates for

institutional and artisanal requirements. These were based upon analysis of institutional requirements in the Bururi area made by the project economist and a review of estimated requirements of brick-makers in Bujumbura and rural areas contained in a World Bank-financed report by Hugo Holiben, Industrie Locale de Construction, January 25, 1980.

As a matter of policy, it is recommended that ONATOUR attempt to protect supplies to the urban domestic market and artisanal users. Industrial users, with the exception of the tea factories, should not be encouraged to use peat unless expected urban consumer demand does not reach the anticipated levels. Institutions have the option of burning either wood or peat for their purposes, so demand in this area can be treated as a residual, with the army, hospitals, schools, etc. encouraged to use peat when it is in excess supply and asked to use wood when it is not.

#### 4. Benefit-Cost Analysis

a. Identification of Project Benefits (See Economic Annex, Exhibit II).

Two different methods have been used to calculate the benefits from the project. The first focuses on domestic effects (See Table I), calculating benefits from the value of peat produced, rural employment generation, and the consumer surplus of charcoal users. The latter benefit arises due to the fact that peat is a substantially cheaper fuel than either charcoal or kerosene which would constitute alternative sources when wood supplies are no longer available. Recent household budget surveys indicate that the urban poor are spending a lower proportion of their budgets on clothing and housing repairs than they did a decade ago, largely due to the fact that the cost of household energy has increased sevenfold in the period. Accordingly, the consumer surplus represents a substantial and significant benefit.

In the case of the second method used to calculate benefits (See Table II), peat production has been valued in terms of the C.I.F. Bujumbura cost of the equivalent Kilo Calories (K-Cals) of kerosene, which is the alternative imported source of energy. The resulting value was reduced by the cost of transporting peat from the bog sites for that portion of production which will be in Bujumbura. The resulting value incorporates both the value of peat produced and the consumer surplus. In addition, however, the benefit from rural employment is over and above the value of the peat production so is, therefore, also counted as a benefit in

the second case. A more detailed discussion of the methods used to calculate these benefits is contained in Annex F, Exhibit II.

#### b. Project Costs

The project costs include contributions by AID and other donors plus the costs to be covered from the QNATOUR budget. These costs were developed by the project economist and the financial analyst based upon information supplied by the GRB and the technicians on the PP design team. They represent the minimum required to achieve project outputs.

Opportunity costs of foregone agricultural production have been netted out of expected project benefits derived from increased rural incomes. Owing to the paucity of data, however, the economic analysis has not taken into account the opportunity cost of foregone production on the land where the bogs will be developed. Although it is generally known that bottom lands are cultivated during the dry season with sweet potatoes, beans and other vegetables, the area cultivated in the proposed bog sites and the value of production on this area is not known. Therefore it is not possible to include this opportunity cost in the analysis. It is expected that this cost would reduce the benefit/cost ratio marginally, but would not alter the overall favorable ratio. It should be noted that this land will be taken out of production only for the period of time that the bog is being exploited. Agricultural production is expected to resume on the bottom lands after the peat has been extracted and the bog areas rehabilitated.

#### c. Benefit/Cost Ratio and Internal Rate of Return

The benefit/cost ratio of the project is 1.94 when peat is valued in terms of domestic production, and 2.08 when peat is valued in terms of the import price of equivalent kilo calories of kerosene based upon a discount factor of 15%. (See Tables I and II respectively.)

The internal rate of return of the project is 38.2 in the first case, and increases to 89.2 in the second case. These represents unusually high returns as compared to most AID projects. They arise, however, due to the fact that peat is an existing and valuable resource, which can be used following a relatively inexpensive process. By comparison, the creation of new resources, such as investment in the establishment of fuel plantations, have much lower rates of return. For example, the World Bank expects a rate of return of 12 percent in domestic market terms and 17.4 percent in import equivalent terms for the eucalyptus plantations included in their Burundi Forestry Project.

#### d. Sensitivity Analysis

Recognizing that project costs could overrun projections as exact production possibilities will not be known until the equipment is tested in field conditions, and also that project benefits could be overstated (it is possible that only a 12 percent addition of residue to peat will be technically feasible for example), a series of sensitivity tests have been run to measure the accuracy of the estimated rates of return. These are:

- Test 1: Increase in costs by 10 percent
- Test 2: Decrease in Benefits by 10 percent
- Test 3: Increase in costs by 10 percent and decrease in benefits by 10 percent

The results of these tests as measured in revised rates of return are:

	<u>Domestic Market Case</u>	<u>Import Equivalent Case</u>
Test 1:	34.08	64.45
Test 2:	33.21	68.14
Test 3:	29.92	54.51

The results of these tests confirm that the project is very sound from an economic point of view.

#### 5. Additional Project Benefits

Over and above the benefits explained in the previous sections, there are additional benefits which are much more difficult to quantify without using an unacceptable number of assumptions. These include improvements in health, agriculture and rural welfare.

The improvement of health will occur among users of charcoal who switch to peat. Burning charcoal emits carbon monoxide; although the dosage is not critical (especially if there is adequate ventilation), its use indoors is believed to be the cause for frequent headaches and loss of energy among women who spend a lot of time cooking. Peat has no such side effects. Improvements in agriculture are directly related to the maintenance of tree cover -- as more trees are cut there is increased erosion and degradation of the soil as well as increased silting of rivers and streams. Use of peat will reduce somewhat the pressure on the remaining forests and help to maintain the quality

of the soil and the quantity of production. Lastly, the introduction of over 2,000 jobs in the rural area will help to stimulate services and artisanal trades and will also reduce to some degree the pressures of rural out-migration. The fact that these are long-term jobs will enhance the general welfare of the areas in which the bogs are located.

## B. FINANCIAL ANALYSIS

### 1. ONATOUR's Financial Performance - Historical

As may be expected, the financial performance of ONATOUR since it first began producing and marketing peat in late 1977 has been poor. However, a primary reason involves the high initial costs of establishing ONATOUR coupled with a total production in the 1977-1979 period of only 4,600 MT, and in 1980 production is estimated at 6,300 MT. Also during this time, the harvesting/mining of peat has been non-mechanized, with the result that ONATOUR experienced up to 50% crumbling and breakage of peat bricks or blocks. Since the broken and crumbled peat had to be bagged before being transported, the price of producing peat was more expensive. According to ONATOUR's annual financial reports, ONATOUR's cumulative financial losses from October 1, 1977 through December 31, 1979 totaled F/Bu 22,732,000 (253,000) and projected losses in 1980 total F/Bu (\$228,000).

The GRB initially capitalized ONATOUR with F/Bu 37,000,000 (\$411,000). In 1979 the GRB provided F/Bu 21,376,959 (\$238,000) to ONATOUR as an operating subsidy and F/Bu 3,623,041 (\$40,000) as additional capital.

Confidence in the financial records of ONATOUR is low. An AID financial analyst reviewed ONATOUR's accounting system in April 1980 and found much to be desired. The accounting system was found to be inefficient; there was an absence of supporting information and documentation; and current management information was not available. For example, the Deputy Director of ONATOUR was solely responsible for cash sales; the only financial reporting was in the form of an annual statement; and management controls were non-existent. These financial accounting deficiencies were recognized by the CRS Project Manager under Peat I, although the Project Manager had little success in improving the financial



system and operations. As an advisor his ability to require changes in ONATOUR's financial practices was limited.

The reasons for these deficiencies are, inter alia, the lack of responsible and capable staff to maintain the financial records, prepare monthly and annual statements and other management reports, all on a reasonably timely basis, and lack of satisfactory cash management procedures and controls. Additionally, the situation is exacerbated by the GRB's requirement that all public sector entities follow the same accounting system which means that service companies have the same accounting systems as manufacturing companies; that is, revenue and non-revenue generating public sector entities follow the same accounting system. Accounting systems should be tailored to provide management with appropriate and timely financial information on which to make financial decisions. The accounting system followed by ONATOUR does not meet the needs of this enterprise.

The need for trained accounting personnel and the installation of a cost accounting system to meet the specific needs of a peat-harvesting/mining enterprise is obvious. Given the critical importance of proper financial management, the GRB has agreed to the need for an expatriate sub-director for finance/administration.

## 2. Financial Projections for this A.I.D. Project

It is envisioned that production will increase from 6,300 MTs in 1980 to 47,500 MTs in 1985. Production is expected to level off at an estimated 59,300 MTs from 1988 through 1993 and drop thereafter (see following chart).

### Production of Peat by MTs for the Years 1980-2000

<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>
6,300	12,500	20,441	29,855	38,000	47,500	52,200	57,000	59,300	59,300
<u>1991</u>	<u>1992</u>	<u>1993</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>	<u>1997</u>	<u>1998</u>	<u>1999</u>	<u>2000</u>
59,300	59,300	59,300	56,300	55,300	55,300	55,300	55,300	44,700	42,400

It should be noted at the outset that this is not a commercial bank's analysis in that non-depreciable items-with the exception of POL and handtools totaling \$182,000 - were not expensed. If that was done the project would have cumulative net losses beyond 1990.

What the design team has done is to pass all these items financed by the A.I.D. Grant on to ONATOUR at no cost. Tangible items, however, were depreciated because they will have to be replaced at a future time, and provision is made to accumulate funds for such replacements.

Annex E presents the unaudited ONATOUR Balance Sheet for 1979, as well as the projected Balance Sheets for the years 1980-1990. It should be mentioned that ONATOUR has on its books two amphi-dredges which were procured for the harvesting/mining of peat. It is unlikely that the amphi-dredges costing the F/Bu equivalent of approximately \$289,000 will ever be used for the purposes intended by ONATOUR. These amphi-dredges have not been depreciated and were not written off in the annexed ONATOUR Balance Sheets because of the possibility that they could be sold. However, if this does not occur these items will have to be written off at some future date.

The sales prices shown in the Projected Profit and Loss Statement, Annex E, (\$30.00/MT in 1981, increased by 5 percent per annum compounded through 1990) are those sales prices which are the minimum required to generate a net profit in 1985 (in 1984 the situation is almost break-even), taking into account the competitive price situation of peat with charcoal. The design team considers the sales prices used in the financial projections to be reasonable under the circumstances. Most importantly, the GRB has accepted the concept that ONATOUR should be managed on a commercial basis, similar to any private sector enterprise. These prices should place ONATOUR on a financially self-sufficient basis as soon as reasonably possible during the life of this project. It should also eliminate the need for the continual subsidization of ONATOUR by the GRB. Consequently, a condition of this grant will be that the sales prices for peat on-site during the early years of production will be at least those mentioned above and shown in Annex E. Also, the GRB has accepted the design team's recommendation that a grace period of 5 to 10 years on the assessment of income taxes on profits (45% in Burundi) be extended to ONATOUR to commence on the first year that ONATOUR shows a net profit (estimated to be 1985). A grace period on the payment of income taxes will enhance ONATOUR's cash position in the years beyond the life of this project.

To the extent that the estimated sales prices used in the financial projections in Annex E may be understated (i.e., the price of the major competing fuel, charcoal, may rise sooner and more rapidly than projected), then obviously the results of operations will be significantly better. Nevertheless, on the basis of the sales prices shown in Annex E, losses totaling

approximately \$1.0 million will be incurred by ONATOUR during the 1980-84 period. From 1985 onward ONATOUR is expected to consistently generate profits. By 1990, ONATOUR should have generated a cumulative net income of close to \$.7 million.

To achieve the higher production levels in the late 1980's, ONATOUR is scheduled to procure an additional eleven semi-automatic macerating machines (5-1986; 401987; and 2-1988) at an estimated cost of \$330,000. Investments in replacement equipment are principally for vehicles until 1989, when replacement of three semi-automatic macerating machines should occur and in 1990 when seventeen of these items should be replaced.

### 3. Recurrent Costs

Except for A.I.D.-financing of POL for equipment and for handtools for one year, and for vehicles during the project, the burden of financing recurrent costs will fall on the GRB. A firm commitment will be obtained during Grant Agreement negotiations so that the GRB will provide in its annual budget an amount equal to the projected ONATOUR loss for that year, beginning with 29.1 million F/Bu in 1981. With these assurances, ONATOUR will be able to finance the recurrent costs of this project. See the GRB letter of application, Annex I.A.

Finally, the financial analysis takes into account on-site sales prices only. The reason is that ONATOUR is a "wholesale" operation and will essentially leave retailing to the existing charcoal marketing/distribution system. ONATOUR does not have a transport fleet; it has used the parastatal transport firm, OTRABU and the Burundian Army's trucks (for bulk sales to the army) to date. A feasibility study undertaken under Peat I argues convincingly against ONATOUR entering the transport business. Aside from the availability of transport from OTRABU, private sector transporters currently transporting charcoal should be available to transport peat once the production of charcoal decreases, as anticipated, in the mid-1980s. Therefore, this analysis assumes that the cost of transportation is passed on directly to the consumer. The Economic Analysis section (III.A) deals in further detail with the question of transportation costs.

### 4. Project Financial Plan

The total estimated cost of the project is \$10,549,000 of which A.I.D. proposes to make \$8,000,000 available. Annex E

presents a detailed financial plan listing the category of items to be financed by A.I.D., the GRB and other donors and the projected disbursement of funds each year by respective donor during the life of this project. A brief summary of the financial plan is found on the following page.

AID.

As shown in the accompanying tables, A.I.D. will finance \$8.0 million of a total \$10.5 million project, or 76.2 percent over five years. A.I.D.'s provision of technical assistance (\$4.6 million) is the largest item and is 43.8 percent of total project costs. The technical assistance component of the A.I.D. project has an inflation factor built into the estimate. An inflation factor of 15 percent compounded is applied to all other A.I.D.-financed items (except technical assistance). In addition, a 5 percent contingency factor was added for all A.I.D.-financed items, including technical assistance.

GRB

The GRB contribution is the U.S. dollar equivalent of \$1,089,000 (which does not include the value of the bog sites) or 11 percent of total project costs, comprised of:

Operating Loss (1980-84)	1,011,000
Purchase of Land for office building	<u>78,000</u>
	\$1,089,000

ONATOUR's operating losses for the years 1980-1984 are projected to total \$1.0 million (see Annex E, Exhibit 1) and this amount will have to be provided by the GRB. It is the understanding of AID/Burundi that the GRB will make available F/Bu 7.0 million (\$78,000) from its 1980 budget for the purchase of land on which the new ONATOUR offices will be located.

A.I.D. will require a firm commitment from the GRB that the GRB will provide \$629,000 in 1980-1981 (operating loss subsidies: \$551,000; and purchase of land: \$78,000). Thereafter, the GRB must include in its budget an amount equal to the projected loss for that year, until such time as ONATOUR shows a net profit (which is projected to be in 1985).

The amounts provided by GRB in excess of ONATOUR's cash loss (operating loss less depreciation expense) for the years 1980-84 will be used to increase ONATOUR's cash balances. These amounts plus the ONATOUR - generated profits from 1985 on, will provide the liquidity necessary to expand future operations into the Grand Marais.

Table I

Summary Financial Plan

(\$000's)

<u>Category</u>	<u>AID</u>		<u>GRB</u> <u>LC</u>	<u>GRI</u> <u>FX</u>	<u>IBRD</u> <u>FX</u>	<u>TOTAL</u>	
	<u>FX</u>	<u>LC</u>				<u>FX</u>	<u>LC</u>
Operating Funds	-	-	1011	-	-	-	1011
Tech. Asst	4602	-	-	1425 <sup>1/</sup>	35	6062	-
Commodities	1611	143	-	-	-	1611	143
Construction	260	-	-	-	-	260	-
Land	-	-	78	-	-	-	78
Promot/Demonst.	-	100	-	-	-	-	100
Training	-	110	-	-	-	-	110
Rentals/Other	-	352	-	-	-	-	352
Cont. & Infl.	642	180	-	-	-	642	180
<b>TOTAL</b>	<u><u>\$7115</u></u>	<u><u>\$885</u></u>	<u><u>\$1089</u></u>	<u><u>\$1425</u></u>	<u><u>\$35</u></u>	<u><u>\$8575</u></u>	<u><u>\$1974</u></u>

The financial inputs, by source and year, are expected to be provided as follows:

Table II

Financial Inputs

by Donor & Year

(\$000's)

<u>Donor</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>TOTAL</u>
A.I.D.	-	1,716	2,403	1,958	1,621	302	8,000
GRB	306	323	260	172	28	-	1,089
IBRD	10	25	-	-	-	-	35
GRI	100	365	240	240	240	240	1,425
<b>TOTAL</b>	<u><u>\$416</u></u>	<u><u>\$2,429</u></u>	<u><u>\$2,903</u></u>	<u><u>\$2,370</u></u>	<u><u>\$1,889</u></u>	<u><u>\$542</u></u>	<u><u>\$10,549</u></u>

<sup>1/</sup> The AAO has received a commitment for \$1.2 million of this amount from the Government of Ireland (GRI); however, the items to be financed by a \$1.2 million credit have not yet been determined.

Finally, as can be seen above, the GRB's contribution to this project is not 25 percent of total project costs and, thereby, does not meet section 110(a) of the FAA. A justification for a waiver of this requirement is presented in Annex A.

#### The Government of Ireland (GRI)

The GRI is providing a grant of the dollar equivalent of \$245,000, of which \$100,000 will be disbursed in 1980 and \$125,000 will be disbursed in 1981-2 (\$20,000 was disbursed in 1979). These funds were provided to finance, inter alia, the training of Burundi nationals in Ireland, an Irish survey team to explore peat potential quantitatively and qualitatively, and technical services to study the feasibility of developing a peat briquette factory in Burundi.

In addition, the A.I.D. Affairs Officer/Burundi has received a verbal commitment from the GRI to provide the dollar equivalent of \$1.2 million to the GRB to assist in developing a peat industry in Burundi. As of the date of this PP, the specific line items to be financed by the GRI have not been established. However, it is expected that the substance and timing of the GRI pledge will be clarified soon.

#### IBRD

This IBRD contribution is part of a much larger effort by IBRD to provide low-cost housing to approximately 1,000 families. The IBRD is providing \$35,000 in technical services (1980-81) to the GRB for the principal purpose of testing peat stoves in Bujumbura, Burundi. (See discussion of IBRD contribution in Other Donors, section II.4.C.)

### C. TECHNICAL ANALYSIS

#### 1. Peat Production

a. Origin of Peat: Peat is the first stage in the formation of coal and is caused by the anaerobic decomposition of vegetable matter. This process takes place under water while plant life at the surface continues to feed the system. It has been estimated that in 1000 years an active peat bog will produce a layer of peat one foot deep. Peat has been defined as containing a minimum of 60 percent organic matter with the remaining composition generally being ash. Peat bogs develop principally in cool climates where rainfall exceeds evapotranspiration. These conditions, which occur throughout much of Northern Europe, occur in the tropics only at high altitudes. The highlands of Burundi are one of those areas. (See Annex B for map of project bogs).

b. Peat Reserves: The magnitudes of Burundi's peat reserves has been the subject of much speculation and until recently little actual survey work has been conducted. Paul Deuse, a geology professor at Butare University in Rwanda, made the original estimate of two billion cubic meters of wet peat, corresponding to approximately 286 million metric tons of dry fuel. W.R. Ruston, a UNDP/UNIDO advisor who worked on peat development in Burundi from 1974-1979, estimated reserves at 300 million tons, including 272 million tons submerged in the Grand Marais of the Akanyaru River valley and 28 million tons in the smaller bogs of the Congo-Nile crest. These figures were based on extremely limited samples extrapolated to the entire area. In the Buyongwe Valley of the Grand Marais, however, a detailed survey was conducted which calculated the reserves at 20 million tons. This figure is impressive until one looks at the technical difficulties of mining and drying peat which is submerged in an undrainable swamp. Furthermore, its intensive exploitation would raise very serious environmental questions. Its immense area carries a considerable volume of water which affects both the stability of the system downstream and the climate of the region.

An Irish survey conducted between August and December 1979, concentrated on highland bogs which are drainable and relatively easy to place in production. At five bog sites (Kishubi, Kitanga, Nyacijima, Kashiru, and Kurunyange) 718,548 tons have been proven with 100% certainty. However, this covers only the area prospected in detail. An extrapolation for the remaining area can be made with a high degree of probability, given the physical similarity. Thus, probably total reserves

for those bogs is 1,021,768 tons.

c. Quality of Burundi Peat: Burundi peat and peat bogs are quite different from those found in Europe, and differ greatly from site to site and from area to area in the same bog. It is characterized by its wide range high ash content (15-40%, 25% average), its low density (0.3 - 0.7), its friability, and its tendency to contain undecomposed begetable matter. Most bogs in Burundi lie in mountain valleys where, over the centuries, there has been substantial runoff from the neighboring hillsides, carrying soil into the bog and thereby increasing the ash content. In Europe, with very few exceptions, peat bogs lie on vast plains and contain very low amounts of ash.

Due to the broad variance of peat in the country, it has been very difficult to market a product of uniform size, shape, weight and density. Some commendable advances have been made since hand maceration has been introduced and slean cutting abandoned. However, it is now apparent that only mechanized maceration of sufficient power will insure the production of sods of consistently high quality from all the bogs of Burundi. The boost in the level of production, and reduction of losses during the handling and transport of the sods, and the improved presentation of the final product for marketing should outweigh the capital expenditure for appropriate peat production technology.<sup>1/</sup>

#### d. Technology Alternatives

Annex C Exhibit 2 contains a detailed discussion of alternative means of producing peat for use as fuel. The simplest method, though not acceptable in Burundi due to the nature of the deposits, is to cut raw peat into bricks and air dry it. The next alternative involves maceration (wetting and mixing) and compaction to improve the cohesiveness of peat sods. The simplest means is hand maceration using shovels and hoes as currently employed; the next level involves mechanical maceration, ranging from bicycle powered to engine powered semi-automatic to fully automatic machines. With the semi-automatic machine proposed under the project, peat is cut by hand, fed by conveyor belt into the machine, and discharged as cut peat sods which are placed for drying by hand.<sup>2/</sup>

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<sup>1/</sup> Excerpted from "Peat Exploitation in Burundi," J. Walton, June 1980.

<sup>2/</sup> See sketch, Annex C, Exhibit



The next level of complexity involves automatic cutting and feeding utilizing the same machine. Further levels involve fully automatic cutting as well as spreading of peat sods.<sup>3/</sup> Yet a further technological alternative is milled peat or peat which is cut by hand or machine into small pieces, all allowed to dry in the field to a certain level then collected and compacted by hydraulic press and dried into briquettes at a processing plant. A final alternative is to process peat sods or briquetted peat into peat charcoal. This alternative is discussed in Annex C, with the conclusion that carbonization is impractical due to the high ash content of Burundian peat.

Due to the limited area of the bogs, limited mechanical skills of ONATOUR employees, and the desire to stimulate rural employment, the smallest mechanical unit which will provide peat sods of adequate quality has been selected. As explained earlier, testing of such machines did not occur under Peat I. Therefore, the initial phase of this project will involve testing and start-up of these machines.

e. Proposed Production

During Phase I the project will test and develop the mechanics of production utilizing the semi-automatic machine. Design modifications may be required to handle the relatively high percentage of undecomposed fibrous material generally found in Burundi peat. Assuming these modifications are made and the semi-automatic machines are shown to produce cost effective, acceptable sod peat, the project will move to Phase II and the initial purchase of 17 machines. A peat expert has thoroughly studied the proposed peat production which can be expected per machine and number of workers required (see Annex C Exhibit 2). This analysis has taken into account the space limitation and shape of project bogs, the limited spreading area in Burundian bogs, the required drying time of peat sods, the productivity of Burundian labor, the length of the peat harvesting season, amount of machine down-time to be expected, etc. The results of this analysis have shown that each machine can be expected to produce approximately 920 tons of dried peat annually and that 45 machines can be expected to meet the production level of 41,400 metric tons in 1985. This basic production figure is expected to be augmented through the addition of approximately 15 percent other organic fuel-like material, e.g. rice or coffee hulls. The expected total production in 1985 is 47,500 tons. The project will experiment with these waste products since they raise the calorific value of sod peat.

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<sup>3/</sup> For comparison of machines, see Annex C Exhibit

f. Bog Reclamation

Project peat bogs are expected to be exploited for the next 9 to 20 plus years. At this time, various reclamation alternatives are being considered, including agriculture, wood lots and fish ponds. Agreement has been reached with ONATOUR that it will assume responsibility for reclaiming these bogs that have been fully exploited. To gain experience in this area, small portions of the flooded bog at Kivogero will be tested for reclamation. In addition, ONATOUR will convene a committee of interested ministries to determine future usage of reclaimed bogs. The EA contains recommendations for testing alternatives reclamation activities during the life of the A.I.D. financed project.

## 2. Peat Marketing

### a. Historical Analysis of Sales <sup>1/</sup>

An interpretation of the character of the market so far developed by ONATOUR can be obtained by analyzing the pattern of past and current sales. ONATOUR started selling peat in October 1977, and the value and approximate quantity of peat sold to date is as follows:

Table 1. ONATOUR Peat Sales

<u>Year</u>	<u>Sales Receipts(FBU)</u>	<u>Quantity</u>
1977 (*)	122,331	37
1978	3,720,230	1,501
1979	6,756,912	2,123
1980 (**)	3,387,229	1,356

(\*) Three months sales, Oct-Dec 1977

(\*\*) Three months sales, Jan-Mar 1980

Despite a steady rise in sales, the initial marketing efforts of ONATOUR under Peat I were somewhat limited. This was due both to the absence of any special marketing expertise within ONATOUR and the nature of the market. Large sales transactions have characterized sales to date. More specifically, the institutional market accounts for approximately 90 percent of sales. This figure can be disaggregated to highlight more meaningful information, viz. that the Burundian Army accounts for over 80 percent of all peat sales, <sup>2/</sup> with the balance being purchased by religious missions located near the bogs. The remaining ten percent is represented by several small briquetteries and the largest bakery in Bujumbura. Almost no effort has gone into developing sales to the urban consumer market.

### b. Potential Consumers

As presented in the Pattinson study, potential consumers are divided into four markets.

First, is the institutional market, currently represented by the Armed Forces and several religious missions, but which could be expanded to include schools, hospitals and larger health clinics and prisons. All these institutions presently use firewood for

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<sup>1/</sup> Taken largely from a May 1980 report by I. Pattinson, The Development of Peat Marketing in Burundi

<sup>2/</sup> The GRB, seeking to provide ONATROU with at least one assured client, arranged for the Burundian Army to substitute peat for firewood (mostly for cooking) in military camps in the vicinity of Bujumbura.

cooking; however, for those located in areas of the country where wood is scarce or for those located near the bogs and along the transport routes from the bogs, peat definitely has potential as either a primary or secondary fuel source. The military market ex-Bujumbura could also be expanded.

- Second, is the industrial market, which is expected to be comprised of a milk factory (AKIRAMATA) and two tea processing factories under construction by the FED. In exchange for FED assistance in developing the Kigozi bog, ONATOUR entered into a 20-year arrangement to supply the factories with 4600 tons of peat per annum. Sales will be at prices somewhat below the retail bog price, and the factories will be responsible for collecting the peat. Under present conditions, few other factories appear to have serious interest in switching to peat; they are likely to continue to rely principally on oil and wood as energy sources. The factory managers interviewed to assess peat's acceptability mentioned several drawbacks: peat is bulky and not easy to store in large quantities; peat has a high ash residue which creates disposal problems; and, the supplies of peat are presently insufficient to assure that capital investments for boiler conversion can be amortized over a reasonable period. N.B. With the discovery of additional reserves, this drawback is likely to be overcome.
- Third, is the commercial/artisanal market, which would consist of bakeries, restaurants, and, possibly, hotels in Bujumbura plus briquetteries and lime kilns. They all currently use wood for fuel. The bakeries, the largest of which already uses peat, as well as others which have experimented with peat, have encountered some problems in its use: too much ash compared with wood; too much smoke and too dirty to handle either as crude peat or as ash; and, peat corrodes fire bars in ovens fitted with them. Except for problems with ash, the improvement in the quality of sods expected from macerated peat and the teaching of proper firing and ventilation techniques is likely to overcome most objections. For the briquetteries, peat is reported to have properties (more even heating) which are superior to wood and which substantially reduces breakage and results in a stronger brick. Lime production has declined in recent years because of a shortage of wood. Peat and wood have been used in combination with very good results, and UNIDO is supporting artisanal lime production schemes in three areas. This program will probably dovetail with the World Bank's interest in the construction materials industry, specifically, development of a artisanal lime industry to reduce cement imports. Once developed, the eventual demand from these two projects could be in excess of 30,000 tons of peat per annum.
- Fourth, is the urban domestic consumer market, principally in Bujumbura and other urban centers near the bogs or along the transport routes. For the reasons outlined in the Economic Analysis, the Bujumbura market, which is the largest user of charcoal, will be the primary target group. There are an estimated 25,000 households

in that market. However, converting this group to charcoal will involve overcoming several obstacles, as Pattinson identified:

"Although the domestic market is probably the greatest potential market for ONATOUR, three years marketing experience and trials by ONATOUR have failed to interest the urban population in replacing charcoal by peat. Consumer resistance is due mainly to the smoke nuisance, tainting of food by smoke, and burning of the thin cooking pots and stove. Also, whereas a charcoal fire can be extinguished with water following cooking, so economising on fuel, a peat fire cannot be extinguished in the same manner, and therefore fuel and money are wasted."

The technological breakthrough needed to develop this market is the introduction of a cheap cooking stove capable of reducing the smoke and tainting problems and burning peat efficiently. Clearly, some modification of domestic cooking technology is necessary to gain broad acceptance for peat, unless ONATOUR is willing to wait until such times as the charcoal or wood markets no longer function. That alternative is unlikely.

Therefore, the experiments with stove design and manufacture presently being carried out under Peat I are important. Progress to date is heartening; stove designs are being tested and a local craftsman/engineer is working on modifications suggested by the Irish industrial engineer-member of the design team. However, more work is necessary and a program of field testing is still to be developed. The sociologist under Peat I will be developing criteria for use in selecting participants for testing and demonstrations. Also, arrangements for local manufacture of the stoves, once design is completed, have yet to be made. An additional year for design testing and lining up artisans interested in stove production is required before any serious attempt will be made to market peat among urban domestic users. Thereafter, the timetable of actions discussed subsequently in the Social Soundness Analysis (p. 48) will be followed.

#### c. Marketing Strategy

The determining factors for conversion to peat among potential institutional, industrial and commercial/artisanal consumers are likely to be similar -- financial (cost of peat vs. other fuels), technical (boiler/stove changes; ash handling; storage) and, to some degree, political (extent of GRB pressure for conversion). Anticipated improvements in the quality of peat will impact on price (less breakage) and on acceptance (easier handling), and a much greater effort on teaching clients the best way to use peat and to adapt boilers and stoves will overcome many of the remaining technical concerns. The problems associated with ash will remain - the chemical content of peat cannot be changed without prohibitively expensive processes, although coffee and rice hull additives will improve

the quality of sod because of a very low ash content.

The determining factors for conversion to peat among urban domestic consumers are somewhat different. Price (particularly among lower income groups) and ease of handling will greatly influence the decision. In addition, however, there is the technical question of an improved or modified cooker/stove and the social questions of the acceptability of a new fuel. In response, the project is aiming significant resources at dealing with these problems -- first, the quality of peat will be greatly improved through maceration, second, ONATOUR will have full-time marketing advisory assistance, including specialized consumer marketing services, to stay abreast of or anticipate problem areas and solutions; third, a demonstration and promotion campaign will educate consumers; fourth, sociological groundwork is being undertaken to identify consumer concerns and provide feedback to the marketing process; lastly, peat will be priced below charcoal. This latter point may ultimately become the deciding factor if wood scarcities grow and charcoal prices jump.

The proposed 1981 price of peat will be approximately 10 percent below the current cost of the equivalent heating value of charcoal (23 FBU vs 25 FBU). This price for peat averages the transport costs from all bogs to Bujumbura. If the urban market were initially supplied from the nearest bogs and the transport savings passed along, the market price of peat would be 20 percent below charcoal (20 FBU vs 25 FBU). Furthermore, the cost of peat is unlikely to rise nearly as sharply as charcoal, thus providing increasingly attractive financial incentives for conversion to peat in the future.

The question of transport will be a key factor in determining ONATOUR's marketing policies. Transport costs are likely to increase in the future, due not only to inflation (which will be offset somewhat by road improvements), but to the fact that peat sites further from Bujumbura will have to be opened to enable production to expand.

The marketing strategy proposed for this project is based on two premises: 1) that institutional, industrial and commercial/artisanal (where possible) sales will be primarily "on-site" sales, with the client providing the transport; and 2) that sales to the Bujumbura urban domestic market, which cannot provide transport, will rely on the existing market structure for charcoal and wood. This strategy minimizes ONATOUR investment and management requirements, and obviates the creation of a monopolistic marketing organization involving substantive expenditures on salaries and transport. At the same time, this strategy provides for a continued livelihood for charcoal dealers who are expected to face a progressive deterioration in their markets as wood reserves are reduced. Given the emphasis in the short term on the non-domestic consumer market for peat, the role of the private sector in peat marketing can evolve as the price differential between peat and charcoal widens in peat's favor and demand increases. This development would coincide with the technological improvements in peat quality which would reduce losses due to breakage during transport.

The charcoal marketing system as currently structured involves middleman (occasionally under license) who engage charcoal makers to produce charcoal in 30-40 kg. bag lots. These are then sold to transporters who supply wholesalers who, in turn, have retail outlet connections. Almost all charcoal sales occur in the public markets. The critical link in charcoal marketing is the transporter, since he is apparently prepared to advance credit to charcoal producers against future deliveries. The wood marketing system also relies on the transporter to link woodcutters to artisanal and institutional users. Thus, with the exception of rural charcoal makers, the existing charcoal marketing structure could be adopted intact for peat.

This projected strategy must be confirmed in practice, and adaptations and changes will be made as necessary. ONATOUR does have a very limited transport fleet (two trucks) to supplement the initial phases of the program, and arrangements with private transporters and OTRABU, the government transport organization, can be made if the marketing strategy takes longer to coalesce than anticipated.

To recapitulate, the project recognizes the key role of marketing and has incorporated significant inputs to address potential problems areas. The project will initially focus on the institutional, industrial and commercial/artisanal markets until the perceived constraints to focusing on the urban domestic market can be overcome. The latter group of users is the principal target group by reason of their current use of charcoal, which is the least efficient energy form presently utilized. By substituting peat for charcoal, the greatest savings in forest reserves can be obtained. Given the costs of transport and to the extent possible, the existing charcoal marketing/distribution structure will be utilized to supply the urban market. All other users will be encouraged to purchase peat "on-site," or to make arrangements for same.

## D. SOCIAL SOUNDNESS ANALYSIS

### 1. Socio-Cultural Feasibility

For the reasons set forth earlier in the paper, the principal project beneficiaries are anticipated to be urban domestic consumers. This group is concentrated in the capital city of Bujumbura, which has an estimated population of 150,000, and accounts for about 75 percent of all urban dwellers. Urban households, particularly in Bujumbura, are great potential users of peat. These households, including a large proportion of poor ones, are already dependent on purchased fuel, principally charcoal. It is estimated that households tend to purchase between one and one and a half bags of charcoal (or 25-40 kg.) per month. At current prices this is 625-1000 FRu (\$7.00-11.10) per month, or as much as 20 percent of disposable income for the lowest 40 percentile in the city. Since peat costs less per calorific unit than charcoal, economic incentive is likely to be the prime motivating force behind adoption of peat for domestic use. Given the serious decline in Burundi's forest reserves, the price difference is expected to widen over the years, making peat even more attractive financially.

Households use fuel mainly for cooking and, to a lesser extent, for heating. About half the Bujumbura households cook inside during both the rainy and dry seasons. Others cook outdoors during the dry season but indoors during the rainy periods. To maximize the effectiveness of peat in cooking and heating, a low-cost, portable peat cooker will need to be designed or existing stove/cooker designs modified for indoor-outdoor use, and a low-cost but more permanent stove designed for indoor use. Acceptance and use of these stoves is probably a critical factor in widespread conversion to peat as the principal fuel. Under the existing Peat I project, some design and experimentation with low-cost stoves has already begun. This activity will be continued under the proposed project. In addition, demonstration of the modified cookers and stoves and encouragement to artisanal cooker/stove manufacturers will be an integral component of the project. For those unable to purchase the modified cookers and stoves, only slight modifications of the existing cooker (imbabura) are necessary to adapt it to peat use. The modification involves closing holes on the sides of the cooker and cutting larger holes in the base area to increase the primary air supply. No significant problems are foreseen in making these modifications.

Since most of the urban houses in Bujumbura have metal roofs, there is little potential danger of fire from sparks. Also,



the population in Bujumbura is relatively stable, with approximately three-fourths of the household heads in the poorer sections living in quarters which they either own or are lease-purchasing, so that this factor will not significantly impede investing in a permanent structured cooker/stove.

In contrast to urban and town residents, rural homesteads are primarily reliant on a free source of fuel. Almost all homesteads have their own trees from which they obtain firewood for cooking and, to a lesser extent, heating. In some areas, however, homesteads unable to meet their domestic needs occasionally purchase firewood. It is highly doubtful that within the next five years the majority of these rural families who would have easy access to peat, i.e. those living in peat bog regions and along the routes from the bogs to Bujumbura, could rely solely or even mainly on peat for fuel. However, if the price of peat were lower than firewood per calorific unit (which is not anticipated) some rural poor might adopt peat as a supplemental source of domestic fuel which cannot be met by their homestead supply. Also, the wealthier rural families might adopt it. In order to eliminate a possible bottleneck to adoption of peat by rural families, the project will also experiment with cookers/stoves using peat suitable to rural homes. A related activity, the Bururi Forest project, also proposed for AID financing, will include a component for the introduction of low-cost, more efficient stoves to reduce the amount of firewood needed by rural households. Currently these households cook over an open fire, so much of the heat is lost. The model firewood cookers found to be acceptable to rural families are expected to be widely disseminated.

The PID for Peat II included a component for community exploitation of small bogs for domestic use and/or sale. At this stage, this component is not considered practical because of a number of managerial, technological and sociological factors. During the lifetime of the project, however, it may be decided that the possibility should be further investigated and ONATOUR's assistance recruited.

## 2. Communications Strategy and Spread Effect

The strategy for gaining acceptance for peat within the urban domestic market--potentially the largest and also the most--will entail a program of publicity followed up by demonstrations in selected areas. It is anticipated that, once known, the benefits of peat will spread by word of mouth among urban groups, particularly

in Bujumbura. Nonetheless, the project team believes it is important to develop a proper marketing plan, a plan that will include an element to educate consumers and non-consumers alike in the proper usage of peat. This should be done to counter any mistaken belief that peat is injurious to health or has any other real or imagined drawbacks.

A sociologist contracted for under Peat I is currently beginning a three-month survey that will examine, inter alia, cooking patterns, fuel consumption, suggestions for improving cooker design, and selection criteria for demonstration participants. Based largely upon those results and the recommendations of the project's marketing advisor and the short-term consumer products specialist, a marketing/publicity/demonstration plan will be developed. The plan is likely to include radio publicity and graphic arts, home demonstrations, and consumer participation in field testing of peat and improved cookers.

The anticipated timetable for these actions is as follows: Year 1 - continued improvements in cooker design, consumer sample testing, and, probably, some field demonstrations. Year 2 - assuming the projected availability of peat, initiation of major publicity campaigns and increased demonstrations and field testing in Bujumbura; general availability of improved, low-cost cookers (initially supported by AID). These actions are expected to capture an estimated 10 percent of the urban domestic market in Bujumbura. Year 3 - continued publicity, demonstrations and residual testing for the Bujumbura market, with some experimentation in two or more urban centers not far from the bogs. Urban domestic fuel demand in Bujumbura is expected to be 20 percent supplied by peat. Years 4 and 5 - continued publicity; by now word of mouth has become a major factor in product's spread effects and peat is supplying over one-half the total urban market demand in Bujumbura and a much smaller but growing demand in other urban markets.

It is expected that the poorer urban households will convert more rapidly to peat because of the financial savings vis a vis charcoal. As discussed in Annex G, 51 percent of the Bujumbura households are below the defined poverty line. For these people with limited incomes the incentive to switch to lower-priced peat will be very strong. As long as the price differential is significant and suitable, low-cost cookers, good quality peat and sufficient retail outlets are available, the adoption for domestic use is expected to be forthcoming.

### 3. Role of Women

The responsibilities of women have been carefully noted in the project design. Given the role of women in obtaining and using fuel, their involvement is critical and the publicity and extension campaigns will primarily focus on the female population. Some urban and rural women will actively participate in the identification of suitable cooking models for peat. Women will also be selected as demonstrators of the cookers. Proper selection of these participants is important for involving locally admired and respected women in the project, and thus enhancing the receptivity of the product. Annex G incorporates a more detailed description of women's roles and further explains ways in which they will benefit from the project.

### 4. Social Consequences and Benefit Incidence

The primary project beneficiaries are expected to be: 12,000 urban households, principally the poorer ones; possibly 25 small commercial/artisanal operations; 2 tea factories; and, perhaps 12 institutions such as schools, hospitals, missions and the army. Adoption of peat will provide them some financial benefit. Also, the families who switch to peat for domestic use will benefit from an improvement in their health. Currently many urban women make charcoal fires indoors to cook as well as to warm their houses. The charcoal fire emits carbon monoxide which without proper ventilation is dangerous to the health of those in the room, often resulting in such signs of physical distress as headaches and loss of energy. Inhalation of the fumes by pregnant women also affects the fetus. In contrast, peat fires are not injurious to health.

Some urban women will participate directly in the decision-making process regarding stove design. A few have already been consulted for their ideas on cookers, i.e. height, location, and the number of cooking places, and additional urban and some rural women are being consulted by the Peat I sociologist. Furthermore, the women who will test the stove models will play an important role in the identification of models which are suitable for use in the demonstration phase. About 120 urban women and their families will directly benefit by receiving cookers and about a two months' supply of peat. These women will be testers and demonstrators of the cooking models developed under the Peat I Project and this project.

In addition, an as yet undetermined number of urban artisans will be trained in stove construction. They will benefit initially from project-financed orders of 1000 modified stoves and subsequently by general market demand.

In rural areas, employment opportunities will be generated, especially during the 6-7 months of the dry season. There is no evidence to suggest that the employment of men during the dry season will have a negative impact on their families' agricultural activities. In fact, in several instances bog laborers have employed other farmers to assist them with preparation of the land. It is anticipated that over 1,700 people will be employed on the peat bogs by the fifth year of the project. Furthermore, after completion of the project, ONATOUR will continue and expand job opportunities (for up to 2100 positions) in rural areas. Since most of the jobs will be for manual laborers and low-skilled personnel, the rural poor are the ones who will principally benefit.

It is not expected that women will be employed on the peat bogs since they are fully engaged with household and farming responsibilities.

However, approximately 50 rural women will directly benefit by receiving cookers and about a two month's supply of peat. The women selected for testing the cookers will play an important participatory role in selection of cooker designs suitable for rural households. The others will be demonstrators of the suitable models.

With regard to employment of workers for the bogs, there will undoubtedly be a question of who gets selected and who gets promoted. As part of ONATOUR's agreed upon operating philosophy, the system of hiring and promotion on the basis of merit will be strengthened.

Adoption of peat by urban households, institutions, artisans, and small commercial enterprises will indirectly effect rural dwellers by lessening the depletion of forests and individual woodlots and possibly by keeping the price of wood from soaring. However, adoption is likely to have a negative effect on charcoal makers as their major market for charcoal - urban dwellers - decreases. The main charcoal producers are wealthy men although numerous small-scale farmers also periodically make charcoal. These people will lose a source of revenue, while society in

general will benefit from forests and woodlots being depleted at a diminished rate. Charcoal transporters and sellers have the option to change their operations to focus on peat. Therefore, they are not expected to be negatively affected, unless by personal choice.

The project contains built-in technological constraints to guard against it negatively impacting on households through displacement of dry season agricultural land. The project advisors and the periodic evaluations will carefully monitor this aspect and, if the findings are negative, will make recommendations to redress the problem.

The project is not anticipated to have a significant effect on changes in power and participation. It will, however, address an equity issue by providing poorer urban households with a cheaper alternative to charcoal for fuel and thereby increasing disposable income.

## E. ENGINEERING ANALYSIS

### 1. Background

ONATOUR currently rents facilities located in Bujumbura containing approximately 100 square meters of usable office space. Annex C Exhibit 3 shows the existing office space (code number 1). In addition, one office has been converted from an existing out-building and is currently being shared by the CRS technical advisor and the Director of Production. Existing office space is inadequate for the current staff. It would be wholly inadequate for the technical advisory team and the increased number of ONATOUR staff projected over the life of the project. The Ministry of Planning has agreed to make funds available to ONATOUR for the purchase of the existing site and facilities, which are now privately owned. AID has been requested to finance new office quarters. An A.I.D. engineer has inspected the site and concurs in the architect's recommendation to demolish existing out-buildings and expand the facilities.

The site has an area of 4000 square meters, of which 900 square meters is covered storage. The site is adequate for temporary storage of dry peat; however, it is expected that the need for peat storage will decrease as markets develop. Assuming this to be the case, the site contains ample space for expansion of offices and for maintenance and repair of vehicles and equipment. Access to the site is assured, both in front and at the rear of the property. The site is adequately served by power and water since Bujumbura has no sewer system, sewage is treated by septic tank with effluent disposed through soak pits. The site is located in a light industrial area and ONATOUR's activities are fully compatible with those of neighboring businesses.

### 2. Headquarters Construction Program

Preliminary plans were prepared by a private architect for three new blocks containing offices, laboratory, workshop and storage facilities. Although these plans call for construction of three structures totalling 985 square meters, only 571 square meters are required to meet the goals of this project. The Ministry of Works (MOW) architect provided a cost estimate of \$280 per square meter for similar office construction with suspended fiberboard ceiling. This figure is based on current cost experience of the GOB. To this, a 10 per cent contingency factor has been added. In addition, the project proposes a 15 percent per annum general inflation factor for all items, including construction (see Financial Plan, Annex E). This is deemed adequate for the period of construction.

Following this analysis and using the assessment of project floor space requirement and the MOW architect's suggestion of a suspended ceiling, a modified construction program is proposed (see Annex C, Exhibit 3), based on construction of 571 square meters at \$280 per square meter. Additional components of the program are demolition, fixed equipment supply and installation, and renovation of one existing building. The estimate of the entire program is thus:

<u>Item</u>	<u>FBu</u>
Demolition	500,000
Construction	14,275,000
571 m x 25,000 FBu	
Equipment	2,900,000
Repairs	1,180,000
	<hr/>
	18,855,000
Contingency @ 10%	1,885,000
Final design and	
Supervision @ 12%	2,263,000
TOTAL	23,003,000 FBu (\$258,000)

### 3. Construction Implementation

ONATOUR, with AID financing and subject to AID regulations, will contract with a local or international (i.e. Code 935) architect and engineering firm operating in Burundi to prepare final designs, specifications and tender documents, assist in contractor selection and supervise construction. The tender documents will be advertised in Burundi with bidding open to Burundian or Code 941 firms. Given the small size of the construction package, no interest by U.S. firms is foreseen. There are at least three Rwandan or Burundian owned construction companies operating in Burundi with the capability to perform the planned construction.

An AID engineer has inspected the site and reviewed the revised plans and implementation plan. The plans are adequate for the purpose of proceeding to a final design and for the purpose of determining a reasonable cost estimate. Due to the high cost of construction in Burundi and the fledgling status of ONATOUR, the AID Engineer has proposed modified construction program which will modestly meet ONATOUR's needs over the project life without constructing under utilized office space. If ONATOUR desires to significantly modify the planned construction, these costs will

be financed from GRB resources as a contribution to the project.

During the life of the project REDSO/EA will be involved in various phases of the construction. Engineering, contracting and procurement staff will be available to review final plans and bid documents, approve contractor selection, make site inspections, etc. The construction program will include purchase of Code 935 origin telephone equipment, fittings, etc. for which cost estimates are not currently available. A waiver will be requested, if necessary, when final designs are prepared. Air conditioners and office furniture will be purchased from the U.S. or 941 countries.

The total construction period is estimated to be 18 months, including final design (2 months), preparation of tender documents and tendering (4 months), analysis of offers and selection and contract award (2 months), and physical construction (see Schedule of Major Events, Section IV.F.). During the period of construction and remodelling the staff of ONATOUR will move to temporary quarters. Funds have been provided for office rental for up to 18 months.

#### 4. Other Construction Elements

ONATOUR will be responsible for locating suitable upcountry housing for bog supervisors and their counterparts. For the Peat I project one adequate and one marginally adequate rental unit were located within reasonable distance of bog sites. If adequate rental units cannot be located for the Peat II technicians and their counterparts, ONATOUR will be required to construct suitable houses as a GRB contribution to the project. As a backup, AID will provide funding for one Portacamp unit which can be used for temporary housing for bog supervisors and also be used in the bog exploration program to house members of field survey teams. There are various other minor construction elements of the project. At the bog sites temporary storage and office facilities are built by project labor. Funds for construction materials will be provided by ONATOUR and no inspections of these structures will be required. Access roads to bogs are also built by project labor using hand tools. Again, these are minor and require no detailed designs or inspections by AID engineers.



## **F. INSTITUTIONAL ASSESSMENT**

### **1. Institutional Evaluation**

ONATOUR is a parastatal organization created in 1977 by the GRB for the purpose of exploiting and marketing Burundi's peat reserves. It functions under the general guidance of the Ministry of Mines and Energy. The Director and Deputy Director are appointed by the President of the Republic and the ONATOUR Statute provides for a ten-member Administrative Council which meets every three months and is responsible for establishing policy. In addition, there is another committee consisting of senior ONATOUR staff that is supposed to provide operational direction. The fixed staff complement of ONATOUR presently numbers 31, of whom three are university graduates and two have completed two-year courses in economics at the University of Burundi. Included in the fixed staff are non-professional level personnel, including secretaries, lab technicians, drivers, guards, etc. In addition, ONATOUR employs foremen, sub-foremen and day laborers at the bog sites who are supervised by Irish bog foremen provided under the Peat I project. Currently 400 workers are employed at two bog sites during the six-month harvest season and less than 200 are employed during the slack season.

As evidenced during the implementation of Peat I, there is considerable room for improvement in ONATOUR's operations. The principal shortcoming appears to be a lack of senior and mid-level staff with business training and experience. This was most evident in the haphazard management of ONATOUR's finances, a situation which must be altered if ONATOUR is to arrive at a position of early financial solvency. In addition, there is both an overcentralization of decision-making, with the Deputy Director responsible for both production and finances, and an unclear division of responsibility. There are other problems involving staff motivation, recruitment and training of staff, control of operations, and planning.

In February 1980, the Peat I project hired a marketing expert with considerable management experience. He has conducted a series of studies to assess the viability of ONATOUR and to make specific

recommendations concerning the institutional development and marketing strategy of ONATOUR. The principal findings of his report, "The Institutional Development of ONATOUR", concern a reorganization of the staffing structure (four operating services), the development of a decentralized mid-management cadre, and the recruitment of expatriate expertise for key line positions during the next critical phase (3-5 years) of ONATOUR's development. The report has been generally well received by the GRB and is strongly endorsed by the PP team. Some of the recommendations are already being implemented (recruitment of mid-level personnel and agreement on a restructuring of the organization) and others await the approval of this project (provision of key line personnel). A revised ONATOUR organization chart has recently been prepared (see Annex H) which places the Deputy Director directly responsible for the Exploitation and Marketing branches and the Director responsible for Administration and Finance. Currently ONATOUR is recruiting for the following key positions:

Chief of Marketing Service

Chief of Finance Service

Chief of Planning Bureau

Chief of Administrative Service

Chief, Sales Branch

Chief, Transportation Branch

Chief, Financial Analysis Branch

Chief Accountant

Due to the lack of qualified, experienced Burundian staff, AID has been requested to fill three line positions in ONATOUR for varying periods of time. These include two experts in finance/administration and marketing/production and a general engineer. The first two will each act in Sub-Director capacity; they will have operating responsibility

for two organizational units apiece and will report to and work with the Director and Deputy Director, respectively. They will become members of ONATOUR's operations committee and will attend the Administrative Council meetings as necessary. They will be contracted for four years, although they will relinquish their line authority at some point in their assignments (once they have properly trained their Burundian counterpart chiefs of section) and become solely advisors. The engineer will work in the Production section (2 years) and concern himself with the construction of ONATOUR's new offices, development of drainage plans for the various bogs, prospecting and peat analysis, and general production matters.

The GRB will be responsible for providing competent mid-level managers to fill the above-listed vacancies. These individuals and existing staff will serve as counterparts to the AID-financed technical experts, and will receive on-the-job training and possibly short- to medium-term training during the life of the project. The technical assistance team and the director of ONATOUR will be responsible for identifying individuals and training sites for ONATOUR employees. Funds for approximately 24 months of training have been budgeted. Training is expected to be conducted in Ireland and third countries. Additionally, short-term advisors in consumer marketing, peat engineering, machinery design and operation will be available to provide on-the-job training. In addition to professional level staff, AID has been requested to provide up to four experienced bog site supervisors who will be responsible for day-to-day management and production operations at the bog sites, plus two fitter/mechanics to assume responsibility for the macerating machines and for training locally recruited mechanic-apprentices. ONATOUR's system of employing casual daily hire labor at the sites is evolving and a cadre of more experienced workers is emerging, including foremen, mechanics, drainage technicians, clerks, etc. ONATOUR is now considering developing a graded promotional system for these employees which will develop trained technicians eventually capable of assuming full supervisory responsibility.

## 2. Infrastructural Assessment

Working conditions at ONATOUR leave much to be desired. The offices are extremely cramped and poorly outfitted; there is insufficient storage area; and the general condition of the building is run-down. To provide the necessary spatial and working conditions that help to attract and retain good staff and to accommodate the growth of ONATOUR, new offices will be constructed and furnished as part of the project.

## 3. Future Status

At the conclusion of the project it is envisioned that ONATOUR will have developed to the stage that further technical assistance needs will be minimal. The finance, marketing and administration sections should be fully assumed by Burundian staff. ONATOUR is expected to be financially self-sufficient. On the technical side Burundians should be fully responsible for conducting lab work, surveys and supervision of production. Continued short-term visits by peat production experts may be advisable to evaluate progress and planning and to assist with specific problem areas.

G. ENVIRONMENTAL ANALYSIS (See EA, Annex D.)

The PID for Peat II was submitted to AID/W for review in March. Per State 105729 the PID was approved but the negative determination requested in the IEE was not accepted by the project committee. The committee made a positive determination and required that an Environmental Assessment (EA) be prepared with the PP design. AID/W listed several environmental issues to be addressed in the EA in State 131922. The EA was prepared simultaneously with the PP and includes, but is not limited to, the issues raised by AID/W. These issues are as follows (numbers in parenthesis refer to pages in EA where the issue is considered):

- Cultivation which will be displaced during the dry season (p. 26).
- Rehabilitation of exhausted bogs for agricultural use (pp. 30-34).
- Increased possibility for damage due to flooding and measures to improve drainage (pp. 21-23).
- Possible pollution of surface and ground water (pp. 23-28).
- Description of ecosystems involving animal and plant life using the bogs as their habitat (pp. 10-17).
- Acceptance of peat as an alternative fuel to wood and charcoal (pp. 28-29).
- Development and acceptability of peat burners solving the smoke and taste problems (p. 29).
- Economic incentives/regulations/policies required to get rural people to shift from free wood to purchased peat as a household fuel and the feasibility of such measures (pp. 17, 26-29, 34-35).
- Development and workability of a maintenance system for macerating machines (pp. 32-33).

The EA determined that no significant environmental problems are anticipated that cannot be prevented or minimized to acceptable levels if the EA recommendations are followed. If the project were not implemented, the EA concludes that Burundi is likely to face an environmental disaster due to

rapid destruction of forests for timber and charcoal use. In recommending that the project be undertaken the EA cautions that: (1) only sites that indicate the least possible negative environmental impacts should be selected for exploitation (i.e., sites with little or no cultivation taking place, and sites having a desirable drainage/catchment area); and (2) the project must undergo a continuous process of evaluation and revision based on experience.

To mitigate the environmental effects of the project, the EA recommends the following:

1. Moisture levels in, and discharge from the peat beds must be carefully monitored to prevent irreversible damage to the bogs.
2. Methods for more efficient peat extraction must be carried out in various bog sites as a guide for future peat removal.
3. Nutrient output from bogs must be monitored in order to prevent nutrient loading of receiving rivers.
4. Test plots must be established as a basis for future reclamation work.

1/ The REDSO/EA Supply Management Officer will take pre-implementation actions to assure that the initial order of three macerating machines are in-country by March 1981. See IV.F. for schedule of events.

## B. CONTRACTS

As mentioned above, it is planned that a number of long and short-term advisors will be financed under this grant (see Annex B). A source waiver to Code 935 will be required to permit acquisition of the following services:

### (From Bord na Mona (Ireland's Parastatal Peat Co.)

1 Mechanic and Maintenance Specialist	for 4 yrs
1 Mechanic and Maintenance Specialist	for 3 yrs
4 Bog Foreman	for a total of 14 yrs
1 General Engineering Advisor	for 2 yrs
1 General Engineer	for 1/4 yr
1 Mechanical Engineer	for 1/4 yr
Other (unidentified at present)	for 1/2 yr

### From Other 935 Source

1 Marketing Specialist for a total of 4 yrs

The above represents a total of 28 person years of services required from Code 935 countries. Bord na Mona has a predominant capability in the production of peat, having many years of experience in developing Ireland's peat industry (also see Section B.4 and Annex H, which presents a general description of the responsibilities of the above individuals). The GRB and ONATOUR have identified a British subject (working under the auspices of CRS under Peat I) to be the Marketing Specialist for the project. A justification for a Code 935 waiver is presented in Annex A.

It is expected that the REDSO/EA contract officer will negotiate direct A.I.D. contracts for the above services from Code 935 sources. Should it develop that some of AID's standard contract provisions are not acceptable to Bord na Mona, REDSO/EA will seek approval for deviations from the appropriate AID/W officials.

It is anticipated that the long-term PSC with a British citizen (marketing specialist) will be completed not later than one month after funds are available. Completion of the second long-term PSC (U.S. citizen, financial administrative specialist) will be done by SER/CM and should be accomplished as soon as possible but not later than the end of January 1981. A PIO/T



will be sent by AAO/Burundi to SER/CM immediately upon grant agreement signing. No candidate has been identified as yet (8/80).

Short-term consultants will be obtained by SER/CM - probably under IQCs.

A long-term contract with Bord na Mona will be finalized by REDSO/EA in time for technicians to begin arriving in Burundi during April, 1981.

The design team does not foresee any major obstacles to the recruitment of the various advisors needed for this Project. Discussions with a representative of Bord na Mona indicated that there are a number of qualified technicians of the type required under this Project that could be made available by Bord na Mona to ONATOUR. Other specialists required under this Project should be readily available in the U.S.

#### C. DISBURSEMENT ARRANGEMENTS

##### 1. GOB Contribution

As mentioned in the Financial Analysis (III.B), as part of its contribution the GRB will have to recapitalize ONATOUR, provide funding for the purchase of land for the new ONATOUR offices, and initially provide for the anticipated operating losses in 1980-81. These initial GRB contributions are estimated to total the F/Bu equivalent of \$0.736 million. A condition precedent to the disbursement of A.I.D. funds will be receipt of assurance that the above amount will be included in the GRB's CY 1981 budget as a line item (s), specifying that these funds are to be transferred to ONATOUR for the timely implementation of this Project.

In the GRB budget of 1982, and thereafter, provision must be made for support to ONATOUR of an amount equal to the projected ONATOUR net loss for that year. These GRB contributions to the Project are necessary to assure that sufficient local currency is available to the Project to cover all operating costs. They total the equivalent of \$450,000 for the period 1982-84.

## 2. Financing Mechanisms

It is anticipated that a number of A.I.D. financing mechanisms will be utilized in this Project. Procurement of major commodity items (see the Project Financing Plan, Annex E) will be financed by Letters of Commitment (L/Coms). To the extent that the use of A.I.D. Direct L/Coms are feasible, they will be used to avoid unnecessary bank charges. Otherwise, standard A.I.D. bank L/Com and L/Credit procedures will be followed.

The procurement of professional services (see Annex H) is likely to require standard L/Com-L/Credit procedures.

A.I.D. financing of local currency costs under this Project will total less than \$150,000. The primary responsibility for financing recurrent Project costs is assumed by the GRB. However, A.I.D. will finance POL for the vehicles and equipment it provides to the Project (\$101,000) and hand-tools for one year (\$52,000). However, Project Implementation Letters (PILs) will be issued describing in detail the financing procedures to be followed in the implementation of this Project.

## D. PROJECT MONITORING AND REPORTING RESPONSIBILITIES

### 1. A.I.D. Project Administration

Primary A.I.D. responsibility for monitoring this Project will rest with the General Development Officer (GDO), AID/Burundi. The GDO has been kept appraised of all developments and negotiations regarding the design and structure of this Project, and his monitoring efforts will be supplemented by the technical expertise (legal, engineering, contract, financial) available in REDSO/EA.

### 2. ONATOUR/GRB

ONATOUR will be the GRB executing agency under this Project. As discussed in the Institutional Assessment section (III.F.), ONATOUR should have the organizational structure and the necessary professional

managerial and technical staff to satisfactorily implement this Project. All phases of Project implementation will be the responsibility of ONATOUR and, during the initial years of this Project, ONATOUR will have the requisite assistance from expatriate professionals to develop the institution.

### 3. REPORTS

a. Quarterly Progress Reports - These reports will be required from ONATOUR beginning April 15, 1981, for the quarter ending March 31, 1981. At that time, most of the expatriate technicians should be on board. These reports will include: (i) a narrative of progress achieved during the quarter; (ii) problems encountered and/or foreseen; (iii) planned solutions to implementation problems; and (iv) identification of the entity (GRB, ONATOUR or A.I.D. ) responsible for specific action or for assistance required to resolve implementation problems. Additionally, ONATOUR will be advised to bring urgent implementation problems to the immediate attention of the GDO.

b. Semi-annual Financial Reports - ONATOUR will submit reports on sales by category of consumer showing quantities sold and corresponding sales revenues to USAID twice a year, commencing on July 15, 1981 for the previous six months. Should the ONATOUR financial year be changed to other than a calendar year, A.I.D.'s reporting requirements may be changed accordingly. The financial report will also include a narrative discussion of marketing and distribution efforts by ONATOUR, problem areas, as well as recommended solutions. Also, a summary of ONATOUR cash position, considering anticipated receipts, will be included which demonstrates that sufficient local currency is available to cover planned operating expenses for the subsequent six months.

A PIL will be issued which will provide suggested formats for these reports.

c. Annual Audits - Sound financial management requires that a firm's financial accounting records be examined periodically by an independent auditing firm. The Ministry of Energy and Mines has agreed in principal to an annual auditing requirement.

During Project Implementation a mutually satisfactory independent Burundian auditing firm will be selected. Audit reports will be due within 90 days after the financial year closes.

#### E. Evaluation Plan

The initial review action, scheduled for July 15, 1981, is not intended to be an evaluation per se. As discussed earlier, it will entail an assessment of the GRB's financial and organizational support and a decision on the appropriateness of the peat macerating technology.

The 'mid-course' project evaluation is scheduled for December 1982, with the expected participation of AAO/Burundi, ONATOUR, Ministry of Mines and Energy, REDSO and, possibly, AID/W. Its objective is corrective, that is, to evaluate progress against anticipated results and as necessary, to identify and recommend changes in program management or project design. The timing will be propitious; with three additional years of implementation, corrective action is possible. Since this project is something of an experiment, particularly in the area of consumer marketing and adoption, the evaluation will be able either to reaffirm the assumptions made in this paper or to propose changes in the direction the project should take.

For purposes of that evaluation, information from a sample of urban, town and rural households provided by the Peat I sociological study will serve as baseline data. Furthermore, information on urban and rural households will be provided from GRB Department of Studies and Statistics studies of fuel consumption. The Department intends to conduct studies on a) provision of wood and charcoal to cities, b) consumption of wood by rural households, c) consumption of wood for housing and other types of construction in rural areas, and d) consumption of wood in urban areas, especially Bujumbura. These studies which will be carried out over the next two to three years, ought to provide the necessary baseline data against which to measure the impact of the project. A slight drawback to the use of the data may occur if the studies, especially those on rural and urban households, are not fully completed by late 1982.

Since the principal obstacle this project will address is not expected to be technical (proper peat production technology) but social (changing consumer preference from charcoal to peat), that will be the focus of the evaluation.

The sociological input will cover the extent to which urban, town and rural households have adopted peat; the identification of bottlenecks to adoption and means to overcome these; the impact of employment generation upon families, e.g. disposal of income, and effect upon agricultural production. The evaluation will also investigate if any groups of people, e.g. charcoal producers and farmers, have been negatively effected by the project. The same topics will be covered in the end-of-project (EOP) evaluation.

In addition, the assessment will also focus on ONATOUR as the implementing institution - its personnel, its financial records, its management practices, its production schedules, and its marketing and extension strategies. Furthermore, the extent and timing of GRB support will be evaluated and appraised.

Since regular monitoring is an integral part of the project, no additional 'mid-course' evaluations are currently proposed. However, the requirement may be identified during the 1982 evaluation. Lastly, an EOP evaluation will measure impact as against targets established in this paper and as revised in the 'mid-course' evaluation. This evaluation is scheduled for September 1985.

F. Schedule of Major Events

<u>CY</u>	<u>Date</u>	<u>Action</u>	<u>Responsibility</u>
1980	Aug.10	PP Reviewed and Approved	AID/W
	Aug.30	Project Authorized	AID/W
	Sept.20	Project Agreement Signed PIL No. 1 Issued	GRB, REDSO AAO
	Sept.20	Quotations requested from Peat	ONATOUR
		Machine Manufacturers	REDSO
	Oct.15	Recruitment for Financial Advisor	AAO, AID/W (SER/CN)
	Nov.30	CPs submitted and approved Funds are available	GRB, AAO REDSO
	Dec.1	Order placed for 3 Macera- ting Machines	AAO, ONATOUR
		IFB issued for PortaVan and Residential Furniture(7)	AAO, ONATOUR REDSO

<u>CY</u>	<u>Date</u>	<u>Action</u>	<u>Responsibility</u>
1980	Dec. 30	PSC with Marketing Specialist signed	AAO, REDSO
1981	Jan	IFB issued for 3 Pick-ups	ONATOUR, AAO, REDSO
	Jan	Contract with Bord na Mona signed for Technical Field Team.	REDSO
	"	Final Design Complete for ONATOUR Office Building	AAO ONATOUR
	"	PSC with Financial Specialist signed	REDSO, AAO
		PIO/T for short-term Consultants	AAO, AID/W
	Feb/Mar	Off-the-shelf items Procured (Handtools & some Peat Stoves);	ONATOUR
	Mar	All Long-Term Consultants on Board	ONATOUR
	Mar.	Preparation of Construction Bid Documents Complete	AAO, REDSO, ONATOUR
	April	3 Macerating Machines arrive by air	AAO, ONATOUR
	"	In-country Training begins	AAO, ONATOUR
	May	Short-term TA arrives	AAO, ONATOUR
	June	Peat Demonstration Program Developed/Initiated	ONATOUR
	July 15	Project Review of Phase I (technological evaluation of macerating machines, GRB Financial Contribution, etc.)	AAO, REDSO, ONATOUR
	July 20	Construction Contract Awarded	AAO, ONATOUR, REDSO
	"	Order Placed for 17 Additional Macerating Machines	ONATOUR, AAO
	Aug.	Construction of Office Building Begins	ONATOUR, AAO, REDSO

<u>CY</u>	<u>Date</u>	<u>Action</u>	<u>Responsibilities</u>
	Dec	IFB Issued for Office Furniture equipment and lab equipment; 1 Pick-up.	AAO, REDSO, ONATOUR
1982	Mar.	17 Macerating Machines Begin Arriving	AAO, ONATOUR
	Apr/May	Furniture & Equip. (Office & Lab) Delivered	AAO, ONATOUR
	June	Office Building completed and Accepted	AAO, REDSO, ONATOUR
	Nov. Dec.	Project Evaluation	AAO, REDSO, AID/W ONATOUR/GRB
1983-84		See Narrative Below *	
1984	Sept.	TD for Opening Commitment Documents (TDCD)	AAO, REDSO, EAAC, ONATOUR
1985	Aug Sept.	End of Project Evaluation Project Assistance Completion Date (PACD)	AAO, REDSO, AID/W ONATOUR
1986	Jan.	TD for Project Disbursements	

\*A number of procurement actions shown in the above schedule will be repeated. For example, 45 semi-automatic macerating machines will be procured over the life of this project as follows: 3-1981; 17-1982; 10-1983; 7-1984; and 8-1985. The same is true for vehicles and other commodities. The procurement of these items is not shown for the 1983-85 period in the above schedule. It is reasonably assumed that orders will be placed at appropriate times during the life of the project, taking into account the experience gained in the procurement of these items in 1981-82, to assure timely delivery in Burundi.

#### G. Issues

Although problems are certain to arise in the areas of peat marketing and distribution, consumer acceptance and, possibly, peat production, these are expected to be resolved in the course of project implementation. No issues requiring AID/W guidance or decision have been identified.

H. Negotiation. Status, Conditions and Covenants

The design team has had fruitful meetings with the GRB, particularly with ONATOUR and the Minister of Mines and Energy. Agreement in principle has been achieved regarding many of the crucial issues relating to ONATOUR's future status as a financially viable entity (see GRB Request For Assistance, Annex A). These matters are discussed in detail elsewhere in the PP (see discussion of ONATOUR in Sections II.B.2, III.B and IIIF). However, final details and specific commitments remain to be negotiated. Accordingly, two initial CPs and one subsequent CP are proposed, in addition to the standard conditions required in all projects.

First, an initial CP is proposed requiring the GRB to evidence its intention to include in the Special Budget for 1981 funds sufficient to cover the purchase of the ONATOUR office site and to offset ONATOUR's projected operating deficit in 1981. (Minimum figures will be specified at the time the agreement is negotiated).

Second, an initial CP is proposed requiring the GRB to submit to A.I.D. for approval a statement of principles that will guide the general operations of ONATOUR. (This statement will be along the lines previously discussed between A.I.D. and the GRB.)

Since certain of the key GRB actions required for ONATOUR to achieve financial viability within the life of the Project will necessarily have to be taken well before July 15, 1981, if the Project itself is to be viable, an additional non-standard CP is to be included in the Grant Agreement. This third CP will provide in essence that prior to disbursement of funds after July 15, 1981, for commodity procurement, construction and training, the GRB shall furnish satisfactory evidence that appropriate steps have been taken to assure that ONATOUR will become financially self-sufficient by the end of the Project. Such evidence shall demonstrate, inter alia that:

(a) The GRB has made timely releases of the funds set aside in its Special Budget for ONATOUR for the fiscal year ending December 30, 1981, and that the GRB is committed to full financing of any subsequent operating deficits through completion of the Project;

(b) Title to land suitable for ONATOUR's offices has been transferred to ONATOUR;



(c) necessary modifications in ONATOUR's operations, including the retention of well qualified persons for key staff positions, have been made.

In addition to the above CPs, covenants in substance as follows are proposed for inclusion in the Agreement:

1. The on-site sales price for peat shall be set at the highest level competitive with alternative fuel sources. This price shall be adjusted periodically, consistent with the objective that ONATOUR shall be financially self-supporting by the end of the Project. (It is anticipated that initially, such price shall be set at 2700 FBu/ton as of 1 January 1981. The initial price will be specified in the Agreement or a PIL).
2. The GRB will undertake for completion by end of Project appropriate studies to determine alternative long-term uses for peat bogs after completion of harvesting.
3. Peat harvesting activities at Nyacijima bog shall not commence until the GRB has presented AID with an acceptable plan for the compensation proposed for farmers and residents who will be displaced or adversely affected by peat production activities.
4. The GRB will assure that bog site workers are hired and promoted on a merit basis.
5. The GRB will assume responsibility for locating and/or providing suitable housing for bog supervisors and their counterparts within a reasonable distance of bog sites. In the event that suitable housing cannot be located, the GRB will construct such housing.
6. The GRB will arrange for annual audits of ONATOUR operations by a private, independent accounting firm.
7. A.I.D. and GRB shall arrange for joint concurrence in the appointment of senior ONATOUR management and advisory personnel, including all division or department heads. (Efforts will be made to make this sensitive covenant more firm during final negotiations).
8. The GRB will identify all counterpart Burundian personnel prior to January 1, 1981, and will take all reasonable steps to assure the timely availability of such counterpart personnel for training and assumption of duties.
9. The GRB shall make provision for inclusion in its annual budget sufficient funds to cover the anticipated earnings shortfall on ONATOUR in each year of the Project.

- DRAFT -  
PROJECT AUTHORIZATION

ANNEX A  
EXHIBIT 1

Name of Country : Republic of Burundi  
Name of Project : Burundi Alternative Energy - Peat II  
Number of Project: 698-0410.09

1. Pursuant to Section \_\_\_\_\_ of the Foreign Assistance Act of 1961, as amended, I hereby authorize the Alternative Energy - Peat II Project (Project) for Burundi involving planned obligation of not to exceed \$ 2,000,000 in grant funds over a five year period from date of authorization, subject to the availability of funds in accordance with the AID/OYB/allotment process, to assist in financing foreign exchange and local currency costs for the Project.
2. The Project will assist the cooperating country in the development of its peat resources as an alternative energy source to wood and charcoal through the financing of long-term technical assistance for the Burundian peat parastatal (ONATOUR), peat harvesting equipment and tools, vehicles and other commodities, training of counterpart personnel, construction of headquarters facilities for ONATOUR, and other related costs.
3. The Project Agreement, which may be negotiated and executed by the officers to whom such authority is delegated in accordance with AID regulation and Delegation of Authority, shall be subject to the following essential terms and covenants and major conditions, together

with such other terms and conditions as A.I.D. may deem appropriate.

4. A. Source and Origin of Goods and Services. Except as provided herein or as A.I.D. may otherwise agree in writing, goods and services financed by A.I.D. under the Project should have their source and origin in the Cooperating Country or in countries included in A.I.D. Geographic Code 941. Ocean shipping financed by A.I.D. under the Project shall be financed only on flag vessels of the United States or the Cooperating Country.

4.B. Conditions Precedent to Disbursement. The Project Agreement shall contain conditions precedent in substance as follows:

(1) Prior to the first disbursement of funds under the Grant, or to the issuance of commitment documents with respect thereto, the Cooperating Country shall furnish to A.I.D., in form and substance satisfactory to A.I.D.

(i) evidence of its intention to include in the Special Budget for 1981 funds sufficient to cover the purchase of the ONATOUR office site and to offset ONATOUR's projected operating deficit in 1981; and

(ii) a statement of principles that will guide the general operations of ONATOUR.

(2) Prior to disbursement of funds subsequent to July 15, 1981, for commodity procurement, construction and training, the Cooperating Country shall furnish to A.I.D., in form and substance satisfactory

to A.I.D., evidence demonstrating that appropriate actions have been taken to assure that ONATOUR will become financially self-sufficient by the end of the Project, including evidence

(i) that the Cooperating Country has made timely releases of funds set aside in its Special Budget for ONATOUR for the fiscal year ending December 30, 1981, and that the GRB is committed to full financing of any subsequent operating deficits through completion of the Project;

(ii) that title to land suitable for ONATOUR's offices has been transferred to ONATOUR;

(iii) that necessary modifications in ONATOUR's operations, including the retention of well qualified persons for key staff positions, have been made.

4.C. Covenants. The Project Agreement shall contain covenants in substance as follows:

(1) The on-site sales price for peat shall be set at the highest level competitive with alternative fuel sources. This price shall be adjusted periodically, consistent with the objective that ONATOUR shall be financially self-supporting by the end of the Project.

(2) The Cooperating Country will undertake for completion by end of Project appropriate studies to determine alternative long-term uses for peat bogs after completion of harvesting.

(3) Peat harvesting activities at Nyacijima bog shall not

commence until the Cooperating Country has presented A.I.D. with an acceptable plan for the compensation proposed for farmers and residents who will be displaced or adversely affected by peat production activities.

(4) The Cooperating Country will assure that bog site workers are hired and promoted on a merit basis.

(5) The Cooperating Country will assume responsibility for locating and/or providing suitable housing for bog supervisors and their counterparts within a reasonable distance of bog sites. In the event that suitable housing cannot be located, the Cooperating Country will construct such housing.

(6) The Cooperating Country will arrange for annual audits of ONATOUR operations by a private, independent accounting firm.

(7) A.I.D. and the Cooperating Country shall arrange for joint concurrence in the appointment of senior ONATOUR management and advisory personnel, including all division or department heads.

(8) The Cooperating Country will identify all counterpart Burundian personnel prior to January 1, 1981, and will take all reasonable steps to assure the timely availability of such counterpart personnel for training and assumption of duties.

(9) The Cooperating Country shall make provision for inclusion in its annual budget sufficient funds to cover the anticipated

earnings, shortfall on ONATOUR in each year of the Project.

4.D. Waivers. Notwithstanding paragraph 4 above and based upon the justification set forth in the Project Paper and its Annexes, I hereby

(1) approve a waiver of the requirement of the FAA Section 110(a) for 25 percent contribution to total Project costs by a participating RLDC;

(2) approve a services procurement nationality waiver from A.I.D. Geographic Code 941 (Selected Free World) to Geographic Code 935 (Special Free World), and for a waiver to permit non-competitive solicitation of services from Bord na Mona, the Irish parastatal peat organization, for up to nine peat specialists as described in Annex \_\_\_\_\_ of the Project Paper;

(3) approve services procurement nationality waiver from Geographic Code 941 to Code 935 and a waiver to permit non-competitive procurement of services from one individual, as described in Annex \_\_\_\_\_ of the Project Paper.

(4) approve a commodity procurement source and origin waiver from A.I.D. Geographic Code 941 to Geographic Code 935 (Special Free World) for the procurement of 45 semi-automatic macerating machines, as described in Annex \_\_\_\_\_ of the Project Paper.

(5) approve a vehicle procurement source and origin waiver from A.I.D. Geographic Code 000 (United States only) to Geographic Code 935 for the procurement of 9 vehicles, 1 truck, 1 portable van and spare parts, as described in Annex \_\_\_\_\_ of the Project Paper.

(6) certify, with respect to subparagraphs b and c above, that the interests of the U.S. are best served by permitting the procurement of services from Free World countries other than the Cooperating Country and the United States;

(7) certify, with respect to subparagraphs d and e above, that exclusion of procurement of the described commodities from countries included in Code 935 would seriously impede attainment of U.S. foreign policy objectives and objectives of the foreign assistance program; and

(8) find, with respect to subparagraph e above, that special circumstances exist to support a waiver of the requirements of Section 636(i) of the Foreign Assistance Act, and do hereby waive such requirements.

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Date

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Administrator

REPUBLIQUE DU BURUNDI

Bujumbura, le 4 juillet 1980



L'ENERGIE  
MINISTRE DE L'ENERGIE  
ET DES MINES  
B.P. 745 - Tél: 3524.  
Cabinet du Ministre

A Monsieur Terry L. Lambacher  
Représentant de l'USAID

à

N/Réf : 750/ 330 /CAB/80.-

B U J U M B U R A .-

V/Réf :

Objet :

Monsieur le Représentant,

J'ai l'honneur de vous confirmer le vif intérêt de notre Gouvernement d'entreprendre le mieux possible et dans les meilleurs délais la deuxième phase du programme de la tourbe ayant pour objet, l'extension de l'utilisation de la tourbe en augmentant la capacité de l'ONATOUR pour réaliser la mission lui confiée. Ceci s'inscrit dans le contexte plus vaste d'utiliser le plus possible les sources nationales d'énergie et plus particulièrement la tourbe pour halter le processus de déforestation.

Le programme envisagé consiste à faire passer le nombre de tourbières en exploitation de trois à présent à six en 1985. Ceci comprendra également l'augmentation de la production de 6.300 tonnes de 1980 à 40.000 tonnes en 1985. Pour arriver à cette production il sera nécessaire de recourir à une forme de mécanisation appropriée. Nous croyons que les machines devraient être testées en 1981. Nous avons l'intention de faire de notre mieux pour vendre la tourbe aux utilisateurs actuels de charbon qui habitent pour la plupart à Bujumbura. Ceci exigera une restructuration de l'ONATOUR et une assistance technique d'experts.

Le Gouvernement du Burundi soutient vigoureusement ce programme et comme preuve du grand intérêt d'exploiter les ressources nationales de la tourbe, nous sommes prêts de prendre les mesures suivantes :

1°) Payer le déficit financier dans les coûts de fonctionnement de l'ONATOUR jusqu'à ce qu'il soit rentable, nous l'espérons pour 1985 au plus tard. Ces coûts d'opération consisteront entre autres dans les dépenses d'un personnel additionnel, dans le fonctionnement du bureau de l'ONATOUR, dans le fonctionnement et l'entretien des machines véhicules et équipements divers et tout autre dépense nécessaire pour que l'ONATOUR fonctionne efficacement.

.../...



- 2°) Débloquer totalement le capital social de l'ONATOUR d'un montant de 37 millions de Francs Burundi comme antérieurement prévu.
- 3°) Acheter le terrain du bureau du siège de l'ONATOUR.
- 4°) Introduire les changements nécessaires dans le fonctionnement d'ONATOUR selon les modalités discutées avec vous pour rendre l'organisation plus viable.

Le montant total à être fourni par le Gouvernement pourra s'élever à 150 millions de Francs Burundi sur une période de 5 ans et un montant de 29.1 millions sera inscrit au budget extra-ordinaire pour l'année 1981 pour couvrir le déficit prévu pour l'année 1981.

Pour soutenir ce programme le Gouvernement du Burundi demande à ce que le Gouvernement des Etats-Unis fasse une contribution de plus de 8 millions de dollars (720 millions de francs Burundi) pour couvrir les coûts d'assistance technique, d'équipement et de machines, de véhicules et les coûts discutés pour la construction des bureaux et la formation.

Etant donné l'importance de ce programme, nous vous serions gré de traiter cette requête avec toute l'urgence voulue.

Veuillez agréer, Monsieur le Représentant, l'expression de ma considération distinguée.

LE MINISTRE DE L'ENERGIE ET DES MINES

Ir. Isidore NYABOYA.-

SOUS-COVERT DE :  
Monsieur le Ministre des Affaires  
Etrangères et de la Coopération  
CABINET DU MINISTRE  
REPUBLIQUE DU BURUNDI

COPIE POUR INFORMATION A :

- Monsieur le Ministre des Finances
- Monsieur le Directeur Général  
de la Géologie et des Mines
- Monsieur le Directeur de l'ONATOUR

B U J U M B U R A . -

[Free Translation]

Letter of Application for AID Funding

(from Minister of Mines and Energy, countersigned  
by the Minister of Foreign Affairs, to the AAO)

Dear Mr. Lambacher:

I have the honor of confirming the strong interest of the Government of the Republic of Burundi to undertake as soon as possible the second phase of a program to expand the production and utilization of peat, through expanding the institutional capacity of ONATOUR, the National Office of Peat, to achieve its mandate. This is part of a broader program to maximize the use of Burundi's energy resources and, in the case of peat, to help conserve the nation's forest reserves.

The program proposes an expansion in the number of bogs where peat will be harvested from three at present to six by 1985. It also includes an expansion in the production of peat from the current 6300 tons projected for 1980 to almost 40,000 tons by 1985. To reach the latter figure it will be necessary to introduce an appropriate form of mechanization. It is our understanding that the testing of machines will be carried out in 1981. It is our intention to make the greatest effort in selling peat to the current users of charcoal, who are principally located in Bujumbura. To do so will require a reorganization of ONATOUR and additional technical expertise.

The GRB fully supports this program. As an indication of its strong interest in the development of the nation's peat reserves, it is prepared to take the following measures:

- 1) Assume the financial responsibility for ONATOUR's projected operating deficits until that organization is financially viable, which we expect will occur by 1985 at the latest. These operating expenses include the salaries of additional ONATOUR staff, the operation of the ONATOUR office, the operation and maintenance of machinery, vehicles and equipment, and such other costs as may be necessary to permit ONATOUR to function effectively.
- 2) Provide funds to replace ONATOUR's original capitalization of 37 million FBu, as previously planned.
- 3) Purchase the land for ONATOUR's office headquarters.
- 4) Introduce necessary modifications in ONATOUR's operations along the lines we have discussed, so as to make it a more viable organization.

The total financial support to be provided by the Government is expected to amount to approximately 150 million FBu over a five year period, and will include a line item contribution in the special national budget for 1981, of 29.1 million FBu for ONATOUR's projected 1981 operating deficit.

-2-

In support of this program, the GRB hereby requests the United States Government to make a contribution of U.S.\$ 8 million (approximately 720 million Fbu) to cover the costs of technical assistance, equipment and machinery, vehicles, and costs for training and construction, as discussed.

Given the importance of this program, your urgent attention to this matter would be appreciated.

Sincerely,

Minister of Energy and Mines  
Minister of Foreign Affairs  
and Cooperation

PROJECT CHECKLIST

Country Checklist is up to date. (See Basic Food Crops Project Paper (695-0101), Annex D.) Standard Item Checklist has been reviewed for this project.

A. GENERAL CRITERIA FOR PROJECT

1. FY 80 App. Act Unnumbered; FAA Sec. 634A; Sec. 653(b);.

(a) Describe how authorizing and appropriations Committees of Senate and House have been or will be notified concerning the project; (b) is assistance within Operational Year Budget country or international organization allocation reported to Congress (or not more than \$1 million over that figure)?

- (a) See Congressional Presentation 1980 and 1981.
- (b) Yes.

2. FAA Sec. 611(a)(1). Prior to obligation in excess of \$100,000, will there be (a) engineering, financial, and other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?

- (a) Yes
- (b) Yes.

3. FAA Sec. 611(a)(2). If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance?

No further legislative action required.

4. FAA Sec. 611(b); FY 80 App. Act Sec. (501). If for water or water-related land resource construction, has project met the standards and criteria as per the Principles and Standards for Planning Water and Related Land Resources dated October 25, 1973?

N/A

5. FAA Sec. 611(e). If project is capital assistance (e.g., construction), and all U.S. assistance for it will exceed \$1 million, has Mission Director certified and Regional Assistant Administrator taken into consideration the country's capability effectively to maintain and utilize the project?

N/A.

6. FAA Sec. 209. Is project susceptible of execution as part of regional or multilateral project? If so why is project not so executed? Information and conclusion whether assistance will encourage regional development programs.

Cooperation and funding by other donors (FED, DANIDO, and Government of the Republic of Ireland) is part of this project. Regional cooperation between Rwanda and Burundi will be necessary before peat reserves in the Grand Marais area are fully exploited.

7. FAA Sec. 601(a). Information and conclusions whether project will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.

- (a) Peat exploitation may reduce use of some imported fuels. thereby allowing use of foreign exchange for other purposes.
- (b) Private initiative and competition among transporters of peat will be encouraged.
- (c) NA
- (d) See answer to (b) above.
- (e) Technical efficiency of peat extraction will be improved.
- (f) There will be no effect on efforts to strengthen free labor unions.

8. FAA Sec. 601(b). Information and conclusion on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).

This project neither encourages nor discourages U.S. private trade and investment. Private U.S. technical assistance may be utilized.

9. FAA Sec. 612(b); Sec. 636(h). Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized to meet the cost of contractual and other services.

Considerable local currency costs will be borne by the host country in the implementation of this project. See financial analysis of project paper.

10. FAA Sec. 612(d). Does the U.S. own excess foreign currency of the country and, if so, what arrangements have been made for its release?

No.

11. FAA Sec. 601(e). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?

Yes.

12. FY 80 App. Act Sec. (521). If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar or competing commodity?

NA.

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

a. FAA Sec. 102(b); 111; 113; 281a. Extent to which activity will (a) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production and the use of appropriate technology spreading investment out from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits of development on a sustained basis, using the appropriate U.S. institutions; (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward better life, and otherwise encourage democratic private and local governmental institutions, (c) support the self-help efforts of developing countries; (d) promote the participation of women in the national economies of developing countries and the improvement of women's status; and (e) utilize and encourage regional cooperation by developing countries?

- (a) The project is designed to expand employment opportunities of the rural poor and increase both labor-intensive production and appropriate technology.
- (b) Although the project does not focus on development of cooperatives, the rural poor will benefit from increased employment opportunities and the urban poor will benefit from cheaper alternative fuel (i.e. peat).

- (c) The project is intended to make Burundi self sufficient in peat production and will to a limited degree encourage self-help efforts to exploit peat.
- (d) Involvement of women is considered critical to the expanded use of peat. In particular, women will participate in the testing and selection of appropriate peat stoves for household use. Women will also be selected to demonstrate the use of various peat stoves and cookers.
- (e) Regional cooperation will be encouraged if and when the peat reserves along the Rwanda/Burundi border are exploited.

b. FAA Sec. 106. Is assistance being made available:

for technical assistance, energy, research, reconstruction, and selected development problems; if so, extent activity is: (i) (a) concerned with data collection and analysis, the training of skilled personnel, research on and development of suitable energy sources, and pilot projects to test new methods of energy production; and (b) facilitative of geological and geographical survey work to locate potential oil, natural gas, and coal reserves and to encourage exploration for potential oil, natural gas, and coal reserves.

(ii) technical cooperation and development, especially with U.S. private and voluntary, or regional and international development, organizations;

(iii) research into, and evaluation of, economic development processes and techniques;

(iv) reconstruction after natural or manmade disaster;

(v) for special development problems, and to enable proper utilization of earlier U.S. infrastructure, etc., assistance;

(iv) for programs of urban development, especially small labor-intensive enterprises, marketing systems, and financial or other institutions to help urban poor participate in economic and social development.

FAA Sec. 106 Assistance is being provided to develop an alternative energy source (peat) in Burundi. The project will (i) (a) collect baseline data, train local personnel, carry out research and development activities designed to utilize peat as an alternative energy resource, and test various methods of peat production;

(b) continue survey work to locate peat reserves; (ii) A U.S. PVO (Catholic Relief Services) has been involved in this project for the past two years along with other donors (FED, DANIDO, GRI). (iii) Research of peat as a viable energy resource for Burundi will be carried on throughout the life of this project. (iv) All exploited bog sites will be suitably rehabilitated for agricultural use or for use in biomass production. See Environmental Assessment prepared for this project. (v) N/A. (vi) The urban poor will benefit under this project by having access to a cheaper fuel source (peat). Small labor intensive enterprises will be encouraged to produce simple, cheap peat burning stoves.

c. FAA Sec. 107. Is appropriate effort placed on use of appropriate technology? (relatively smaller, cost-saving, labor using technologies that are generally most appropriate for the small farms, small businesses, and small incomes of the poor.)

A major emphasis of this project is directed at using labor intensive methods of peat extraction, simple, semi-automatic methods of peat preparation, and inexpensive small stoves to burn peat.

d. FAA Sec. 110(a). Will the recipient country provide at least 25% of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or has the latter cost-sharing requirement been waived for a "relatively least developed" country)?

The 25% cost-sharing requirement has been waived. Burundi is a "relatively least developed" country.

e. FAA Sec. 110(b). Will grant capital assistance be disbursed for project over more than 3 years? If so, has justification satisfactory to Congress been made, and efforts for other financing or is the recipient country "relatively least developed"?

N/A; Burundi is a "relatively least developed" country.

f. FAA Sec. 281(b). Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civil education and training in skills required for effective participation in governmental processes essential to self-government.



This project is aimed at providing an alternative energy resource (peat) which is badly needed by the people of Burundi. Through training and education under this project many Burundians will participate in the development process which will lead to greater participation in the governmental processes essential to self-government.

g. FAA Sec. 122(b). Does the activity give reasonable promise of contributing to the development of economic resources, or to the increase of productive capacities and self-sustaining economic growth?

g. Yes.

ACTION MEMORANDUM FOR THE ADMINISTRATOR

FROM: Goler T. Butcher, AA/AFR

SUBJECT: Commodity Procurement Source Waiver

PROBLEM: Request for a procurement source waiver from Geographic Code 941 (Selected Free World) to Geographic Code 899 (Free World)

A. Cooperating Country	Burundi
B. Authorizing Document	Project Paper
C. Project	Burundi Peat II (695-0103)
D. Nature of Funding	Grant
E. Description of Commodities	45 Semi-Automatic Peat Macerating Machines
F. Estimated Cost	\$1,179,000 CIF Bujumbura
G. Probable Source	Ireland, Denmark or Germany

DISCUSSION: The purposes of the Burundi Peat II Project are twofold: first, to conserve the country's forestry reserves by increasing the availability and acceptability of peat as an alternative energy source; secondly, to strengthen the institutional capacity of ONATCJR to carry out present and planned operations on an efficient basis and without need for significant future financial or technical support. By increasing the amounts of peat commercially available and, concurrently, by stimulating the demand for its use, an increasing share of the markets that buy solid fuel (principally urban domestic, institutional, artisanal/commercial and industrial) can be converted to peat. This would reduce pressure on the country's rapidly depleting forests, which provide the fuel source for the overwhelming majority of the population. One of the A.I.D. inputs to this project is the financing of 45 peat macerating machines, which are required for the effective exploitation of the country's peat fuel resources. The machines have the capability of producing peat sods of uniform quality which are sufficiently firm to undergo transport to markets within Burundi without substantial loss due to breakage. The peat macerating machines are an integral requirement for the successful implementation of the project.

There are no semi-automatic peat macerating machines manufactured in the United States or any other Geographic Code 941 country. The relatively simple machine proposed for use under the project is manufactured in Ireland, Denmark and Germany. Any waiver of (change in) the authorized list

of eligible countries or geographic code must be based upon one of the criteria listed in A.I.D. Handbook 1, Supplement B. One criterion under this list is the unavailability of the commodity from countries included in the authorized geographic code of the project.

RECOMMENDATION: On the basis of the above discussion, it is recommended that you (1) approve this request for a source waiver in the approximate amount of \$1,179,000 to permit the procurement of the above described machines from countries included in the Geographic Code 899, and (2) certify that exclusion of the procurement from free world countries other than the cooperating country and countries included in Geographic Code 941 would seriously impede attainment of U.S. foreign policy objectives and objectives of the foreign assistance program.

Approved: \_\_\_\_\_

Disapproved: \_\_\_\_\_

Date: \_\_\_\_\_

ACTION MEMORANDUM FOR THE ASSISTANT ADMINISTRATOR FOR AFRICA

SUBJECT: Vehicle Procurement Waiver (Source/Origin)

PROBLEM: Request for a commodity procurement source/origin waiver from Geographic Code 000 (U.S. only) to Geographic Code 935 (Special Free World)

A. Cooperating Country	Burundi
B. Authorizing Document	Project Grant Agreement
C. Project	Burundi Peat II (696-0103)
D. Description of Commodities	9 Pickup Trucks - \$108,000 1 Ten-Ton Truck - 56,000 1 Porta-Van - 25,000 Total \$189,000
E. Probable Origin	Japan, Sweden, West Germany, England and/or France
F. Probable Source	Burundi

DISCUSSION: To provide the implementing agency under the project, ONATOUR, with the means for increasing peat production to desired levels and also to enable its staff to function under more acceptable working conditions, A.I.D. inputs for the project include the above listed vehicles to augment ONATOUR's existing small fleet and provide both A.I.D.-funded technicians and key ONATOUR staff with mobility.

Section 636(i) of the Foreign Assistance Act, as amended, prohibits A.I.D from financing motor vehicles unless such vehicles are manufactured in the United States. Section 636(i) does provide, however, that "...where special circumstances exist, the President is authorized to waive the provisions of this section in order to carry out the purposes of this Act." In addition, in accordance with A.I.D. Handbook 1, Supplement B, procurement of motor vehicles of other than U.S. manufacture requires a waiver. The Handbook provides that a waiver may be granted when necessary to carry out the purposes of the FAA and if, inter alia, there is a present or projected lack of adequate service facilities and supply of spare parts for U.S.-made vehicles or when U.S. manufacturers can not provide the necessary vehicles, e.g., right-hand drive. Authority for determining that special circumstances exist and waiver approval has been delegated to you by A.I.D. Delegation of Authority No. 40, dated March 5, 1978.

Experience with U.S. manufactured vehicles in Burundi indicates that adequate supplies of spare parts are not available and competent repair service is non-existent, since there are no local

representatives of any U.S. firm. The situation is exacerbated as vehicles age and are subjected to poor maintenance. The Embassy and AID continue to strongly recommend the purchase of foreign manufactured vehicles which can be readily serviced locally. In this regard, both the Embassy and AID have purchased non-U.S. manufactured vehicles for staff field use.

RECOMMENDATION: On the basis of the above discussion, it is recommended that you (1) conclude that special circumstances exist at this time to warrant the procurement of non-U.S.-manufactured vehicles, and (2) certify that exclusion of procurement from free world countries other than the cooperating country and countries included in Code 941 would seriously impede attainment of U.S. foreign policy objectives and objectives of the foreign assistance program.

Approved: \_\_\_\_\_

Disapproved: \_\_\_\_\_

Date: \_\_\_\_\_

ACTION MEMORANDUM FOR THE ADMINISTRATOR

Annex A

Exhibit 4-d

FROM : Goler T. Butcher, AA/AFR  
SUBJECT: Services Procurement Nationality Waiver

PROBLEM: Request for a procurement nationality waiver from Geographic Code 941 to Code 935 and a waiver to permit non-competitive procurement of services from one individual .

- (a) Cooperating Country: Burundi
- (b) Authorizing Document: Project No. 695-0103
- (c) Project: Alternative Energy - Peat II
- (d) Nature of Funding: Grant
- (e) Description of Services: Peat Marketing Specialist
- (f) Approximate Value: \$570,000
- (g) Source: United Kingdom
- (h) Period of Services: Four (4) years
- (i) Previous Source Waivers: See Attached

DISCUSSION: It is requested that the needed services (described in Section II.B of this PP and summarized below) be obtained from Mr. Ian Pattinson who is a British subject and is presently working in Bujumbura, Burundi under the Peat I project, which is scheduled to be terminated October 31, 1980.

Mr. Pattinson is a marketing specialist whose skills and experience make him uniquely qualified for this assignment. He has had almost 20 years of African experience in this field, including Senegal, Ghana, Gambia and Tanzania. Since 1973 he has worked almost continuously under USAID contract on food storage and marketing projects in Zaire (1975-79) and Niger (1973-1975). In 1979 he undertook a major evaluation of the USAID Food Storage and Marketing Project in Rwanda. Most important, Mr. Pattinson has worked these past several months for ONATOUR under the Peat I project, which is AID-financed.

Mr. Pattinson is thoroughly familiar with the operations of ONATOUR and has produced the following excellent studies of ONATOUR's operations: 1) Economic Analysis, 2) Institutional Development, 3) Development of Peat Marketing, and 4) Peat Feasibility Study. Unquestionably, Mr. Pattinson is highly competent and a most important asset to ONATOUR and the GRB. It is for the above reasons that the GRB wishes to continue the services of Mr. Pattinson under Peat II.

For all practical purposes there is not a U.S. national currently available with similar qualifications and perhaps, more importantly, with a proven track record in Burundi. As mentioned throughout the body of this PP, a principal aim of the Peat II project is to strengthen ONATOUR and, during ONATOUR's formative years, the marketing of peat is a critical area on which this project will focus. It is extremely doubtful, even given an extended lead time which this project can ill afford, if an individual of Mr. Pattinson's calibre could be located, put under contract and brought up to Mr. Pattinson's level of expertise and familiarity with Burundi and ONATOUR.

Mr. Pattinson will hold the position of Sub-Director for Marketing and Production if this procurement action is approved. He will be an advisor to the Director of ONATOUR and will be a member of the Operations Council, with direct line authority for the departments of marketing and production. In that capacity, he will be responsible for developing a consumer marketing plan and a publicity campaign and overseeing the peat demonstration program. He will also have the responsibility of coordinating the field production team and arranging for peat transport. On the basis that Mr. Pattinson is uniquely qualified, will be immediately available, is fluent in French, is experienced in working with ONATOUR, has sufficiently established his credibility with the GRB so as to have been requested by them to work under Peat II, and is highly endorsed by CRS and the AAO/Burundi, an extended, time-consuming search for an alternative candidate is not deemed justifiable under the circumstances.

RECOMMENDATION: For the reasons stated above, it is recommended that you (a) authorize the procurement of services from Mr. Pattinson without solicitation of these services from other sources, and (b) approve a waiver for the

procurement of services from Code 941 to allow procurement of these services from an individual of Code 935 nationality. In doing so, it is further recommended that you certify that the interests of the U.S. are best served by permitting the procurement of services from Free World Countries other than the cooperating country and countries included in Code 941.

APPROVED: \_\_\_\_\_

DISAPPROVED: \_\_\_\_\_

DATE: \_\_\_\_\_



ACTION MEMORANDUM FOR THE ADMINISTRATOR

FROM : Goler T. Butcher, AA/AFR

SUBJECT: Services Procurement Nationality Waiver

PROBLEM: Request for a procurement nationality waiver from Geographic Code 941 to Geographic Code 935 and for a waiver to permit non-competitive solicitation of the services of the specialists listed in the Discussion section below:

- A. Cooperating Country: Burundi
- B. Authorizing Document: Project No. 695-0103
- C. Project: Alternative Energy - Peat II
- D. Nature of Funding: Grant
- E. Description of Services: Various - Related to the harvesting and marketing of peat and maintenance of peat-harvesting machinery.
- F. Approximate Value: \$3,320,000
- G. Probable Source: Ireland
- H. Previous Source Waivers: None

DISCUSSION: It is requested that the following peat specialists needed to perform the services described in the body of this PP be obtained from Bord na Mona, Ireland's parastatal peat company:

<u>No</u>	<u>Description Title</u>	<u>Person Years Required</u>	<u>Estimated Cost</u>
2	Mechanic and Maintenance Specialists	7 yrs	\$1,012,000
4	Bog Foremen	14 yrs	1,992,000
1	General Engineer	2 yrs	252,000
1	Industrial Engineer	$\frac{1}{2}$ yrs	34,000
1	Mechanical Engineer	$\frac{1}{2}$ yrs	30,000
	TOTAL	24 yrs	\$3,320,000

Section II.B of this PP presents a description of the type of inputs to be provided by the above-listed specialists. These specialists will provide services that are unique to a peat harvesting/maintenance/marketing operation.

Briefly, the General Engineer will supervise work on all bog sites, develop bog drainage plans, be responsible for laboratory sampling of bog materials and assist the ONATOUR Production Chief in field matters. The bog Foremen will organize production workers and machinery use at bog sites, direct peat cutting and drainage.

The Mechanic and Maintenance Specialists will handle preventive and corrective maintenance on up to 25 macerating machines each, at various bog sites. The Industrial Engineer, having great familiarity with all aspects of peat production, will be available for brief periods to advise on production, drainage, equipment, etc. The Mechanical Engineer, with expertise in semi-automatic macerator design, will work with the initial group of 3 test machines to evaluate their efficiency and adaptability to Burundi's bogs and provide designs for any necessary modifications. The long-term personnel described above will also be responsible for counterpart training.

Aside from the U.S.S.R., Bord na Mona is recognized world-wide as the foremost authority in all phases of peat exploration, production and marketing. Most important for this Project, Bord na Mona has a history of expertise in labor-intensive peat production methods. Additionally, the GRB, ONATOUR, and USAID/Burundi have experienced favorable results using Bord na Mona personnel under the Burundi Peat I Project. The GRB and ONATOUR are, therefore, most anxious to continue working with Bord na Mona, especially since there has been a demonstrated competence displayed by Bord na Mona personnel under Peat I.

A waiver for non-competitive procurement of services to permit negotiation of a long-term technical services contract with Bord na Mona for the above-listed specialists is requested herein under AID Handbook 1 Supplement B, Chapter 12.B.2.g. This provision permits such a waiver where one source is considered to have predominant capability. For reasons summarized above, it is believed that Bord na Mona does possess such capability.

Finally, it should be added that the technical assistance portion of this Project is central to its success. A major aim of this Project is to strengthen the institution called ONATOUR, to enable it to effectively manage the production and marketing of peat. Production by semi-automatic macerating machines, maintenance of such machines and marketing skills will have to be transferred to Burundians if ONATOUR can become an effective organization as promptly as possible with a minimum of continued outside assistance. Bord na Mona is clearly the best source of technical assistance for this purpose.

RECOMMENDATION: For the reasons stated above, it is recommended that you (a) approve a nationality waiver for the procurement of services from Code 941 to allow procurement of these specialists' services from Code 935 sources, (b) authorize the non-competitive negotiation of the above listed specialists' services from Bord na Mona (parastatal peat company in Ireland) without solicitation of these services from other sources, and (c) that you certify that the interests of the U.S. are best served by permitting the procurement of services from free world countries other than the cooperating country and countries included in Code 941.

- 3 -

APPROVED \_\_\_\_\_

DISAPPROVED \_\_\_\_\_

DATE \_\_\_\_\_

ANNEX B  
EXHIBIT 1

BURUNDI: PEAT II PROJECT

AID 1020-10 (11-78)  
SUPPLEMENT 1

PROJECT DESIGN SUMMARY  
LOGICAL FRAMEWORK

(INSTRUCTION: THIS IS AN OPTIONAL  
FORM WHICH CAN BE USED AS AN AID  
TO ORGANIZING DATA FOR THE PAR  
REPORT. IT NEED NOT BE RETAINED  
OR SUBMITTED.)

Life of Project  
From FY \_\_\_\_\_ to FY \_\_\_\_\_  
Total U.S. Funding \_\_\_\_\_  
Date Prepared: \_\_\_\_\_

Project Title & Number: BURUNDI PEAT II PROJECT (695-0103)

PAGE 1

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Program or Sector Goal: The broader objective to which this project contributes: (A-1)</p> <p>To maximize the effective utilization of Burundi's limited energy resources.</p>	<p>Measures of Goal Achievement: (A-2)</p> <p>Significant reduction in the net deforestation of Burundi's forestry reserves.</p> <p>Increased use of peat as an alternative form of energy.</p>	<p>(A-3)</p> <p>Survey of wood/charcoal usage.</p> <p>GRB statistics on forest harvests.</p> <p>Peat production and sales statistics.</p>	<p>Assumptions for achieving goal targets: (A-4)</p> <p>GRB commitment to afforestation</p> <p>GRB commitment to encourage the use of peat as a substitute for charcoal and wood.</p>

PROJECT DESIGN SUMMARY  
LOGICAL FRAMEWORK

Project Title & Number: **BURUNDI PEAT II PROJECT (695-0103)**

Life of Project:  
From FY \_\_\_\_\_ to FY \_\_\_\_\_  
Total U.S. Funding \_\_\_\_\_  
Date Prepared: \_\_\_\_\_

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Project Purpose: (D-1)</p> <p>1. To conserve Burundi's forestry reserves by increasing the availability and acceptability of peat as an alternative energy source.</p> <p>2. To strengthen the institutional capacity of ONATOUR.</p>	<p>Conditions that will indicate purpose has been achieved: End-of-Project status. (B-2)</p> <p>Net drawdown of Burundi's forestry reserves will have been significantly slowed.</p> <p>ONATOUR will strengthen its internal operations, will possess a trained staff, and will cover its operating costs. Annual peat production will increase to 47,500 tons by 1986.</p> <p>60% of Bujumbura's urban domestic market will be using peat by the end of the project.</p>	<p>(B-3)</p> <p>Forestry Department records.</p> <p>ONATOUR records.</p> <p>ONATOUR production statistics.</p> <p>ONATOUR sales records/survey of household users.</p>	<p>PAGE 2</p> <p>Assumptions for achieving purposes: (E-4)</p> <p>Use of peat proves acceptable to domestic consumers and becomes major solid fuel used in urban areas, especially Bujumbura.</p> <p>Revenues from peat sales will cover operating costs. ONATOUR will establish a viable marketing system for the Bujumbura area.</p> <p>Appropriate mix of labor and machine production methods will be developed in 1981.</p> <p>Appropriate stove technologies will be developed for domestic use of peat (urban and rural).</p>

PROJECT DESIGN SUMMARY  
LOGICAL FRAMEWORK

Project Title & Number: **Burundi PEAT II Project (695-0103)**

Life of Project:  
From FY \_\_\_\_\_ to FY \_\_\_\_\_  
Total U.S. Funding \_\_\_\_\_  
Date Prepared: \_\_\_\_\_

PAGE 3

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Project Outputs: (C-1)</p> <p>1. <u>Trained ONATOUR Staff</u> On-the-job trained bog managers; marketing specialists; financial analysts.</p> <p>Field surveyors, quality control experts, laboratory technicians, and engineer (on-the-job and some third country training).</p> <p>2. <u>ONATOUR Management Capability</u> and Establishment of general/cost accounting systems.</p> <p>3. <u>Technical questions resolved:</u> a. Household use b. Production</p> <p>4. <u>Development of Commercial Bogs.</u></p>	<p>Magnitude of Outputs: (C-2)</p> <p>6 bog managers 4-8 mechanics 2 financial experts 4-6 field surveyors 2-4 laboratory technicians 1 general engineer 2 Marketing specialists</p> <p>Effective accounting system in operation.</p> <p>Revenues cover operating costs by the fifth year of the project.</p> <p>6 Bogs in production by 1983 (annual production about 47,500MT at end of project; 57,000 MT when bogs fully developed).</p> <p>Employment of up to 2400 workers on all bogs by 1985.</p> <p>General use of a project-sponsored, low-cost cooker stove by urban households Development of a suitable, low-cost cooker for rural households.</p>	<p>(C-3)</p> <p>ONATOUR/AID/GRI training records/evaluation.</p> <p>ONATOUR records, EAAC review and evaluations.</p> <p>ONATOUR records and evaluations.</p> <p>ONATOUR Records.</p> <p>ONATOUR records and evaluations.</p>	<p>Assumptions for achieving outputs (C-4)</p> <p>ONATOUR hires and makes available appropriate personnel for project implementation and training.</p> <p>GRB accepts and implements a new operating philosophy, stressing business-like operation for ONATOUR.</p> <p>GRB provides adequate budget support for staff and equipment until ONATOUR becomes self-supporting.</p> <p>Technical assistance team is properly selected and provides appropriate on-the-job training.</p> <p>No unmanageable problems will be encountered in selection of semi-automatic macerators.</p> <p>Public acceptance and use of project-supported cooker/stove.</p> <p>No problems encountered in hiring sufficient bog labor.</p>

PROJECT DESIGN SUMMARY  
LOGICAL FRAMEWORK

Life of Project:  
From FY \_\_\_\_\_ to FY \_\_\_\_\_  
Total U.S. Funding \_\_\_\_\_  
Date Prepared: \_\_\_\_\_

Project Title & Number: **BURUNDI PEAT II PROJECT (695-0103)**

PAGE 4

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Project Inputs: (C-1)	Implementation Target (Type and Quantity) (D-2)	(D-3)	Assumptions for providing inputs: (D-4)
1. <u>AID</u>			
a. <u>Personnel</u>			
Long-term:			
Marketing Specialist -----	48 months		
Financial Specialist -----	48 months		
General Engineer -----	24 months		
Fitter and Maintenance Specialist (2) -----	84 months		
Bog Foremen (4) -----	120 months		
Short-term:			
Industrial Engineer -----	3 months		
Consumer Marketing Specialist -----	3 months		
Mechanical Engineer -----	3 months		
Sociologist -----	3 months		
Local-Hire -----	18 months		
Other -----	6 months		
b. <u>Training</u> -----	24 months & in-country		
c. <u>Commodities</u>			
Macerators -----	45 semi-automatics		
Vehicles -----	9 pickups, 1 portavan, 1 ten ton truck		
Office equipment/furniture -----	\$97,000		
Lab equipment -----	\$ 8,000		
Residential furniture -----	\$99,000		
Mechanics tools -----	\$29,000		
Peat production tools -----	\$52,000 (initial supply)		
			<p>AID - \$8,000,000 GRB - \$1,089,000 GRI - \$1,425,000 WB - \$ 35,000</p>

PROJECT DESIGN SUMMARY  
LOGICAL FRAMEWORK

Life of Project:  
From FY \_\_\_\_\_ to FY \_\_\_\_\_  
Total U.S. Funding \_\_\_\_\_  
Date Prepared: \_\_\_\_\_

Project Title & Number: BURUNDI PEAT II PROJECT (695-0103)

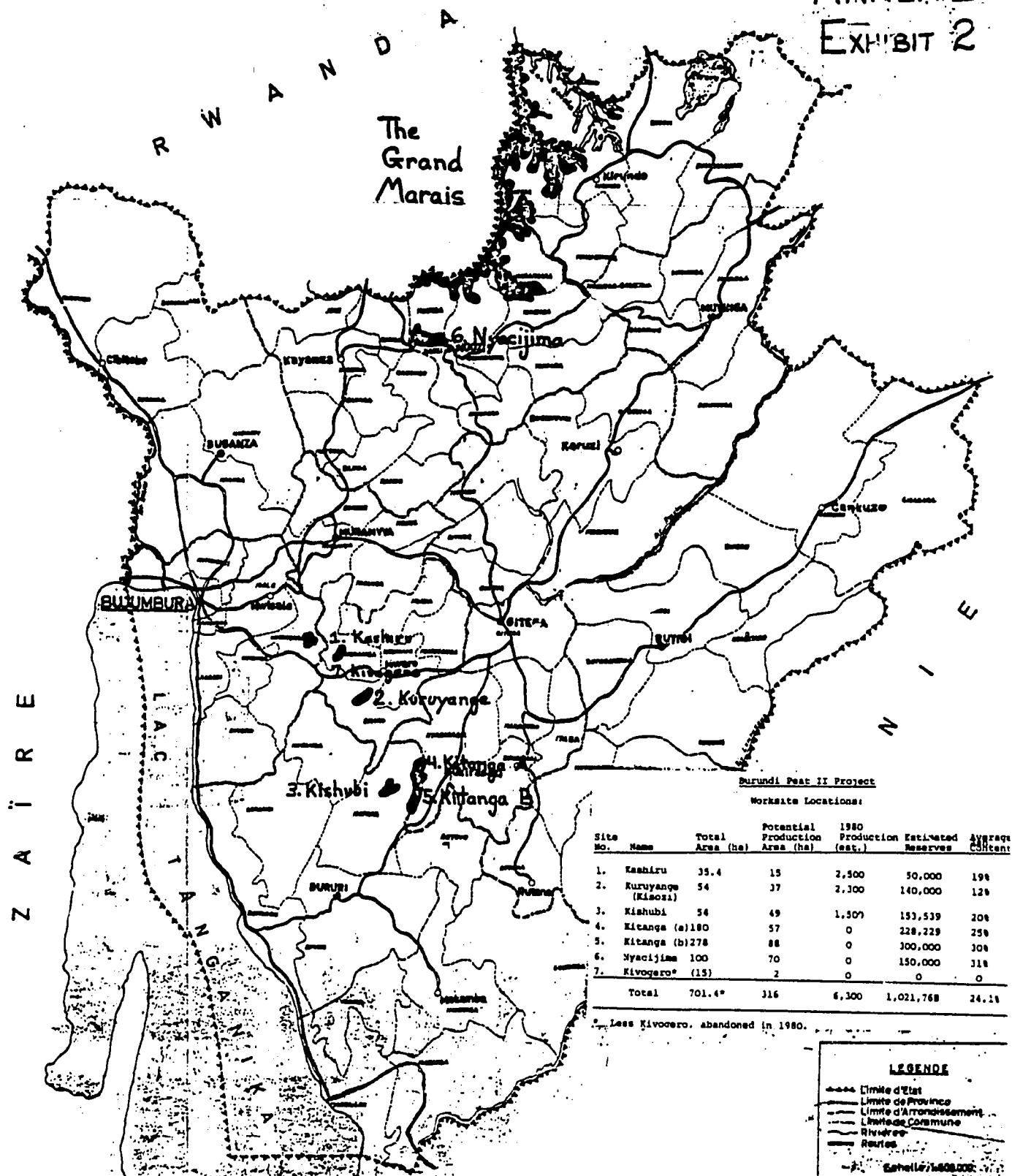
PAGE 5

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Project Inputs: (D-1) (cont'd)	Implementation Target (Type and Quantity)	(D-3)	Assumptions for providing inputs: (D-4)
<u>d. Promotion/Publicity</u>			
Peat Stoves	1000 units		
Publicity/Demonstrations	\$80,000		
<u>e. Construction</u>			
Housing rentals-----	Bog sites: 3 for 1 year; 4 for 3 years Bujumbura: 3 for 4 years; 1 for 3 years; 1 for 2 years.		
Office rental: -----	18 months		
POL -----	For 3 semi-automatic macerators for 1 year; 9 pickups for 1 OP.		
Inflation and contingency @ 20% combined -----	\$845,000		
2. <u>GRB</u>			
<u>a. land</u>	\$78,000		
<u>b. Operating Support</u>	\$1,011,000		
3. <u>GRI</u>			
<u>a. Bord na Mona</u>	\$225,000		
<u>b. Unassigned</u>	\$1,200,000		
4. <u>World Bank</u>			
a. Stove design assistance	\$35,000		



REPUBLIQUE DU BURUNDI  
DISTRIBUTION DES COMMUNES

ANNEX B  
EXHIBIT 2



TELEGRAM AMEMBASSY NAIROBI USAID

OFFICIAL FILE :  
FILE CODE

SECTION

UNCLASSIFIED

REDSO FILE

ANNEX B  
Exhibit 3  
Page 1 of 4 pages

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FM AMEMBASSY BUJUMBURA  
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UNCLAS BUJUMBURA 1080

STATE 105729 BEING REPEATED FOR YOUR INFO

UNCLAS STATE 105729

AIDAC

E.O. 12065: N/A

TAGS:

SUBJECT: BURUNDI PEAT II PID REVIEW

REF: (A) STATE 90811, (B) BUJUMBURA 819, (C) BUJUMBURA  
810, (D) STATE 022908 (78), (E) BUJUMBURA 096 (73), (F)  
YATES MEMO DATED 12/22/77 (G) NAIROBI 67 2

1. COMMITTEE MEETING MARCH 31 RECOMMENDED APPROVAL OF  
SUBJECT PID. COMMITTEE DID NOT ACCEPT NEGATIVE DETERMINA-  
TION REQUESTED BY IEE AND REQUESTS POSITIVE DETERMINATION  
INSTEAD, WITH EA TO OCCUR SIMULTANEOUSLY WITH PP DESIGN  
(SEE PARA 1.D. BELOW). FOLLOWING POINTS WERE NOTED FOR  
FURTHER CONSIDERATION IN PP.

A. THE COMMITTEE BELIEVES THAT SEVERAL TECHNICAL QUESTIONS,  
RELATING PARTICULARLY TO ACCEPTABILITY OF PEAT, MUST BE  
RESOLVED BEFORE PROJECT CAN SUCCEED; AND METHODOLOGY FOR  
THE RESOLUTION OF THESE PROBLEMS SHOULD BE ADDRESSED IN PP.  
THESE INCLUDE DEVELOPMENT OF SUITABLE BURNER, I.E., ECONO-  
MICALLY AND CULTURALLY ACCEPTABLE, FOR PORTION OF PEAT  
PRODUCTION DESTINED FOR HOUSEHOLD CONSUMPTION. QUESTION  
WAS RAISED AS TO APPROPRIATENESS OF BURNER DEVELOPMENT IN  
DUBLIN. PREVIOUS EXPERIENCE INDICATES THAT DEVICES OF THIS

TYPE ARE BEST DEVELOPED IN CONSULTATION WITH VILLAGE  
WOMEN IN VILLAGE SETTING AND PP SHOULD EXPLORE THIS  
APPROACH. THE COMMITTEE ALSO RECOMMENDS THAT CONVERSION  
OF PEAT INTO FORM BURNABLE WITHOUT STOVES BE CONSIDERED.  
THE PP SHOULD INCLUDE AN ASSESSMENT OF ONATOUR'S CAPA-  
BILITY FOR MAINTAINING AS WELL AS OPERATING MASцерATING  
MACHINES NOW BEING COUNTED ON TO SOLVE THE SOD BREAKAGE  
PROBLEM.

B. REGARDING INSTITUTIONAL FRAMEWORK FOR PEAT INDUSTRY,  
PID RECOMMENDS ASSESSING CAPACITY OF PRIVATE TRUCKERS  
TO TRANSPORT PEAT BEFORE EQUIPPING ONATOUR WITH TRUCK  
FLEET, AS IS PRESENT INTENTION OF GRB. IN LINE WITH  
THIS APPROACH, POSSIBILITIES OF INVOLVING PRIVATE SECTOR  
IN MARKETING AND EVEN PRODUCTION OF PEAT SHOULD BE  
THOROUGHLY EXPLORED.

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DATE DUE

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ANNEX B  
EXHIBIT 3  
Page 2 of 4 pages

5

C. NUMBER OF BENEFICIARIES, DIRECT AND INDIRECT, SHOULD BE CLEARLY ESTABLISHED IN THE PP. THE PROJECTS RELATION TO AND COMPATIBILITY WITH BURURI FOREST PROJECT, TOUCHED ON IN PID, SHOULD BE DESCRIBED IN DETAIL. REGARDING FOUR SMALL BOGS TO BE WORKED BY RURAL POOR, WHAT INCENTIVES WOULD THERE BE FOR THEIR PARTICIPATION? PP SHOULD ALSO DISCUSS CRITERIA TO BE USED IN SELECTING SMALL FARMERS FOR PARTICIPATION AS WELL AS ORGANIZATIONAL ARRANGEMENTS.

D. PROJECT COSTS APPEAR UNDERSTATED, PARTICULARLY FOR TECHNICIANS BUT ALSO FOR EQUIPMENT, HOUSING, AND INFLATION AND CONTINGENCY. FUEL FOR MASHERING MACHINES APPEARS NOT TO BE INCLUDED.

E. REVIEW OF PEAT I AIP (698-0410.9) APPROVAL DOCUMENTATION SHOWS THAT ENVIRONMENTAL ASSESSMENT WAS ANTICIPATED FOR PEAT II (695-0103). SEE PARA 2 OF REFS E AND F AND PARA 1B OF REF D). CONSIDERATIONS UNDERLYING THIS VIEW ARE BELIEVED STILL TO APPLY. PARA 4.C OF REF B ALLOWS INSUFFICIENT TIME FOR PREPARATION OF E.A. BELIEVE SHOULD BE FOUR WEEKS AND THAT PART OF PEAT EXPERT'S AND SOCIOLOGIST'S TIME SHOULD BE BUDGETED FOR ASSISTING IN PREPARATION OF EA.

2. IN CONNECTION WITH PP STRATEGY (PAGES 18 AND 9 OF PID), PLEASE INFORM AID/W OF LL CONTRACT TEAM MEMBERS THAT AID/W WILL BE RESPONSIBLE FOR RECRUITING. IT IS NOT CLEAR WHY PEAT EXPERT SHOULD BE OF IRISH NATIONALITY. IF IRISH PEAT EXPERT IS REQUIRED, POSSIBILITY OF IRISH FINANCING AS PART OF THEIR ASSISTANCE TO GRB SHOULD BE

EXPLORED. INCLUSION OF GENERAL ECOLOGIST AS WELL AS BOG ECOLOGIST IN DESIGN TEAM WOULD SEEM DESIRABLE, AS WOULD FULL FOUR-WEEK STAY IN COUNTRY FOR ALL TEAM MEMBERS. ADVISE ALSO IF TROPICAL SWAMP ECOLOGIST MAY BE REQUIRED FOR THE EA. TIME REQUIRED FOR TEAM MEMBERS TO ARRIVE FROM WASHINGTON IS MINIMUM SIX WEEKS FROM DATE OF THIS CABLE. IN VIEW OF THIS AND OTHER SCHEDULING COMPLICATIONS, PROJECT DESIGN TIMETABLE SET FORTH IN PID IS NOT ATTAINABLE. SINCE COSTS OF PROJECT EXCEED DELEGATION OF AUTHORITY TO AAO AND REDSO/EA, PROJECT MUST BE SUBMITTED TO AID/W FOR REVIEW AND APPROVAL.

3. PLEASE SEND COPIES OF STUDIES REFERRED TO IN PP STRATEGY SECTION AND ALSO OF PEAT I EVALUATION TO WASHINGTON ASAP FOR ORIENTATION OF ANY WASHINGTON-BASED MEMBERS OF DESIGN TEAM AS WELL AS FOR AID/W INFORMATION. VANCE

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BURUNDI PEAT II PROJECT PAPER

ANNEX B

RESPONSE TO AID/W PID GUIDANCE CABLE

Exhibit 3

The concerns expressed in the PID approval cable (State 105729), attached hereto, are addressed here in the same order as they are stated in the cable.

A. Technical

One model of a peat cooker is being developed under the Peat I project and other models will be designed by a consultant under this project. The Social Soundness Analysis (Annex G) details the method for testing model cookers for durability and user acceptability.

The macerating machines that will be used in this project are not mechanically complicated. It is anticipated that ONATOUR's capability to operate and maintain these machines will be built up gradually. Qualified expatriate mechanics will provide a total of 84 months service under this project and it is expected that sufficient Burundian counterparts will receive the necessary on-the-job training to fully take over these responsibilities by the end of this project.

B. Transportation:

A report prepared by CRS in April 1980 regarding a possible Peat II project argues convincingly against ONATOUR entering the transport business. The A.I.D. design team fully concurs with the CRS recommendation and this position is supported in the body of the PP.

Briefly the design team rationale is: 1) a relatively large quantity of peat is sold to the Burundian Army and the Army uses its trucks to pick up the peat at the bog sites.

2) a parastatal transport company, OTRABU, has a fleet of trucks and can provide transport to market peat.

3) it is reasonably expected that charcoal sales will decrease rather sharply in the mid-1980's and, those private sector truckers presently transporting charcoal, will be available to transport a good portion of the peat production under this project.

C. Social

With the exception of this project's tie-in with the Bururi Forest Project, all other social concerns are addressed in the Social Soundness Analysis, III D and Social Soundness Exhibits, Annex G.

The Peat II Project primarily addresses the urban domestic market of charcoal users. In comparison, the Bururi Forest Project aims at: a) preservation of a natural forest; b) reduction of soil erosion; and c) provision of construction and saw timber, and firewood. Further, the

-2-

Bururi Forest Project will include the development of a cooker to reduce the amount of firewood required by rural households. The above-mentioned Social Soundness Analysis explains the reasons why rural families are not expected to adopt peat as their main source of fuel within the next 5-10 years.

D. Project Costs

As can be seen from the Financial Analysis section of the PP and Annex E, Exhibit 3, the A.I.D. Grant is for \$8.0 million, substantially higher than anticipated in the PID. Annex E, Exhibit 3 presents a fairly detailed financial plan showing the items to be financed by the A.I.D. Grant and the design team considers the estimated costs included in the financial plan to be reasonable.

E. Environmental

The recommendation of A.I.D./W has been followed and a detailed Environmental Assessment is included in this PP.

Synthesis of Reports on ONATOUR  
Operations (June 1980)

Annex B  
Exhibit 4

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- 1 -

Four reports have been prepared by Mr. I. Pattinson, Economic Consultant, for Catholic Relief Services.

Part I Economic Analysis ONATOUR (March)

Part II Institutional Development - ONATOUR (April)

Part III The Development of Peat Marketing in Burundi (May)

Part IV Feasibility Study ONATOUR (May)

The following synthesis outlines the salient points and problems discussed and analyzed in those reports.

A considerable increase in the production and marketing of peat will be required if ONATOUR is to cover its operating costs. Sales of peat in Bujumbura have been made at a loss because of the proportionately high cost of transport (compared with the production cost) not being covered by sales revenue. Recommendations have been made for Bujumbura and 'on site' sales prices based on an analysis of historic costs and anticipated improvement in production quality, particularly density. As a first step towards covering costs, it has been recommended that the Bujumbura sales price be increased from 3,200 F.Bu./ton to 5,000 F.Bu./ton (i.e. 160 F.Bu. to 200 F.Bu. for a 40 kg sack). This recommendation will probably come into effect in July with the arrival of the 1980 harvest.

Sales policy should be directed to as high a percentage of 'on site' sales as possible, with a uniform sales price at all sites. Although production costs will vary according to site, particularly with the introduction of mechanized methods, it is not practical to provide for different sales

prices at sites within a short distance of each other. A uniform price of 2,400 F.Bu./ton has been recommended based on the averaging of production costs and projected production.

In the case of the tea factories, a concessionary sales price of 1,921 F.Bu./ton has been recommended, based on the convention signed between ONATOUR and the tea companies requiring the former to amortise the initial capital investment through repayment in kind over a 30 year period.

Although the initial economic analysis report (Part I) prepared in March recommended higher sales prices than those indicated above, they have been subsequently revised downwards in the Part III report because of the anticipated reduction in transport costs resulting from the mechanized production of a higher density peat sod.

Marketing of peat is presently orientated towards the Forcés Armées, and whilst this outlet provides ONATOUR with revenue and experience, it is desirable that the sales base be expanded to other sectors of the market.

The domestic market is potentially the largest for peat, but awaits the introduction of suitable cooking technology before substitution of charcoal and wood can take place. The artisanal market is presently using peat in small quantities but could expand considerably with the growth of the lime kiln industry. This area is presently receiving support from UNIDO and consideration by the World Bank (IBRD). Both the peat and lime industries would appear to be beneficiaries from closer integration of project development plans. The industrial market

with the exception of the tea industry, would not appear to present any future potential for peat demand because of investment considerations and the fact that known exploitable peat reserves in the highland areas are limited and represent some 10 years only of possible demand.

The domestic market is therefore THE sector requiring priority development by ONATOUR.

It is predictable that the wood and charcoal markets will undergo significant change within the next 8 - 10 years as wood becomes scarcer and peat substitution will progressively fill the solid fuel gap using existing marketing channels for those fuels.

The charcoal transporter will provide the natural link up to those markets without the need for ONATOUR to assume a monopolistic marketing role basically because of his resources and connections. By then the 'on site' sales policy of ONATOUR should be sufficiently developed logistically to provide for successful integration of the public and private sectors in the peat industry.

It is recommended that ONATOUR keep their investment in transport vehicles to a minimum, either hiring OTRABU transport for Bujumbura sales or encouraging transporters to purchase on site.

No particular correlation has been proposed between the sales price of peat and its calorific content. The latter varies within and between different sites due to variable ash content and different sales prices based on calorific value may give rise to market manipulation or disputes. The consumer is also not in a position to verify the calorific value of the peat he or she is purchasing.



-4-

In respect of assessing more accurately production tonnages, recommendations have been made which should enable ONATOUR to measure stocks and have a more precise figure for output. This will also enable a more finite analysis of unit costs to be obtained.

As the development of the peat industry in Burundi will be largely dependent upon ONATOUR, considerable attention has been given to its institutional development within the next six years. Proposals encompass the growth of middle level management capability, a separation of managerial and operational functions within a planned staffing structure, and a change in the financial year to correspond to trading activity.

A feasibility study based on historic costs and projected to 1985 emphasizes the two criteria which will dictate the financial viability of ONATOUR - the fixed cost element of annual recurrent expenditure and the volume of sales revenue. It has been shown that ONATOUR could be self financing as early as 1982 if sales revenue of 41 million F.Bu. (16,000 tons) can be achieved within a fixed cost expenditure of 20 million F.Bu. The study incorporated the budgetary proposals for institutional development (Part II), the projected sales revenue (Part III) as well as investment and depreciation.

To assist ONATOUR in its development, proposals have been submitted for consideration by government and USAID to strengthen ONATOUR within the second phase of the peat project. It is recommended that the Government should give major priority to providing funds for the purchase of the COFFEX concession presently occupied but not owned by ONATOUR, and USAID provide funding for extension of office accommodations, equipment and technical assistance in finance and marketing.

**BURUNDI: PEAT II PROJECT**  
**TECHNICAL ASSISTANCE**

(in \$000's)

**ANNEX B**  
**EXHIBIT 5**

	@ \$10,000 Per person/mo. CY 1981	@ \$11,000 Per person/mo. CY 1982	@ \$12,500 Per person/mo. CY 1983	@ \$14,000 Per person/mo. CY 1984	@ \$15,000 Per person/mo. CY 1985	Total
<b><u>Long-Term</u></b>						
1. Marketing Specialist (4 years)	\$ 120	\$ 132	\$ 150	\$ 168	-	\$ 570
2. Financial Specialist (4 years)	120	132	150	168	-	
3. General Engineer (2 years)	120	132	-	-	-	252
4. Mechanic and Maintenance Specialist (1 man for 4 years and another for 3 years)	120	264	300	328	-	1,012
5. Bog supervisors (3-1981; 4-1982-83; 3-1984)	<u>360</u>	<u>528</u>	<u>600</u>	<u>504</u>	-	<u>1,992</u>
Sub-Total Long-Term	840	1,188	1,200	1,168		4,396
<b><u>Short-Term</u></b>						
1. Industrial Engineer (3 months)	10	11	13	-	-	34
2. Consumer Marketing Specialist (3 months)	20	11	-	-	-	31
3. Mechanical Engineer (3 months)	30	-	-	-	-	30
4. Sociologist (3 months)	30	-	-	-	-	30
5. Local Hire Engineer-Stoves (18 months)	9	5	-	-	-	14
6. Other (6 months)	20	22	25	-	-	67
Sub-Total Short Term	<u>119</u>	<u>49</u>	<u>38</u>	<u>-</u>	<u>-</u>	<u>206</u>
Grand Total Technical Assistance	<u>959</u>	<u>1,237</u>	<u>1,238</u>	<u>1,168</u>		<u>\$4,602</u>

BURUNDI PEAT II PROJECT

Tools and Equipment Lists

A. Lab and Field Equipment

1. pH Meter - Digital model, line operated, Accumet Model 630 or equivalent	\$695
2. Muffle Furnace - Automatic temperature and timing controls	3000
3. Top Loading Balance - Dial-o-gram model 1650 or equivalent	95
4. Fine Balance - Dial-o-gram model 100 R or equivalent	485
5. Lab Drying Oven - small forced draft oven, Econotemp model 15f or equivalent	525
6. Conductivity Meter - Equivalent to YSI model 39 with lead	396
7. Miscellaneous - Glassware, thermometers, reagents, lab supplies	1000
8. V-notch weirs (locally fabricated)	400
9. Soil Moisture Meter - portable, reads in micrams, similar to soil test model MC 305B, with probes	255
	<hr/>
Subtotal	6851
Airfreight (estimated)	800
	<hr/>
Total lab and field Equipment	7651

ANNEX B  
Exhibit 6

**B. Mechanics and Miscellaneous Tools and Equipment**

1. Vise, Machinists, 4" jaws	\$ 186
2. Drill Press, floor model, 3/4 hp	926
3. Grinder, 2 wheel, 6"	158
4. Welder, electric, 225 amp	312
5. Welder, AC, 250 amp, and power plant, 16 H.P, gasoline engine powered	1936
6. Master Mechnic tool set	6500
7. Compressor -1hp	1280
8. Hydraulic Jack	562
9. Miscellaneous shop Tools and Equipment (local purchase)	3000
10. Platform balance, 1000 lb, (5)	1800
11. Truck Scale, portable	6076

Subtotal	\$22736
Estimated Air freight	\$ 7000

Total Mechanics Equipment \$29736

**C. Office Furniture**

1. File Cabinets (11)	\$ 1716
2. Desks (27)	5991
3. Straight chairs (58)	3087
4. Desk chairs (24)	1584
5. Shelves (30)	3328
6. Bookcases (13)	1358
7. Type writer stands (6)	330
8. Tables (15)	1553
9. Conference Table (1)	249
10. Drafting Table (2)	478
11. Stool (2)	74
12. Map Storage cabinet (1)	328
13. Lab benches (locally made)	1500
14. Bin Storage (10)	2200

ANNEX B  
Exhibit 6

15. Garage benches (locally made)	1000
16. Storage cabinets (5)	490
17. Miscellaneous	2500
Subtotal	<hr/> \$27766
Sea freight and Inland Transport (estimated)	\$47600
Total Office Furniture	<hr/> \$75366

D. Office Equipment

1. Air conditioners (17)	\$ 9384
2. Typewriters (6)	1398
3. Calculators (2)	280
4. Copy machine (2)	4000
5. Duplicating machine (1)	384
6. Office/Field combination safes (6)	2190
Subtotal	<hr/> \$17636
Air freight (estimated)	\$ 8800
Total Office Equipment	<hr/> \$26436
Grand Total: All equipment + freight	\$139,189

ANNEX B  
Exhibit 7

BURUNDI PEAT II PROJECT  
Peat Production Tools

<u>Quantity</u>	<u>Item</u>	<u>Unit Cost</u>	<u>Cost U.S. \$</u>
95	Wheel barrows	\$55.00	5225.00
229	Shovels	5.50	1259.50
545	Hoes	2.50	1362.50
40	Rakes	7.00	280.00
339	Molds	18.00	6102.00
75	Buckets	7.00	525.00
12	Axes	5.00	60.00
8	Saws	7.00	56.00
9	Hammers	4.00	36.00
135	Ropes	9.00	1215.00
40	Machettes	3.00	120.00
4	Measuring Tape	52.00	208.00
40	Grass Cutters	3.00	120.00
17	Nails (Kg)	1.70	28.90
400	Wooden Poles	3.50	1400.00
59375	Sacks	0.28	16625.00
300	Roofing sheets	6.00	1800.00
45	Tarpaulins	80.00	3600.00
-	Miscellaneous	-	2000.00
			<u>42022.00</u>
			* <u>10000.00</u>
			52022.00

\* In addition, up to \$10,000 for a mix of tools is required for laborers involved in small bog development

Peat Production AnalysisA. Introduction

The production of peat sods by special shovel (slean), as practiced traditionally in Europe and in a small scale context still in Ireland, is not practical in Burundi. A sod is a brick shaped piece of peat which when dry, after considerable shrinkage (30%) has dimensions of about 20 cm by 7 cm by 7 cm. In Europe the hand produced sod has a specific density of about 0.5 and a bulk density of circa 3 to 4 cubic meters per ton. Peat in Europe is of a sphagnum base and allows production of an inherently strong sod for local use. In Burundi the peat is of a fen type reed base which when cut in sods quickly falls asunder and gives rise to much "bruss"(fines and smalls).

Manual Maceration

In Burundi , on finding that simple sleam production resulted in large quantities of bruss, it was demonstrated that an improved, more durable and denser sod of peat could be produced by thorough mixing by shovel, hand, feet, etc. This worked well, and since mid-1978 there has been a changeover from earlier production methods to what is termed manual maceration with considerable reduction of bruss and increase in sod density, thus lowering transport losses and improving market sales attractiveness.

As maceration is obviously of premier importance in sod peat production, and can when done by manual means, be both backbreaking, inefficient and impossible to control to high quality standard, it is essential that at least the maceration be done by mechanical means.

To this end it has been urged that a sod production machine be procured as used extensively in Ireland at a time of high labor availability after World War II. This machine - the semi-automatic macerator - is fed by hand with raw peat newly excavated by shovel. The peat travels up a scraper conveyor into an efficient peat macerator. There, it is screw pushed through a nozzle in two parallel streams onto a travelling slat conveyor of 7 to 10 meters in length. The peat stream is continuous (if the feed quantity is disciplined and steady) and measures about 30 cm wide X 10 cm deep. It moves at a speed of perhaps 3 to 4 seconds per meter. The peat stream is indented by a rotating cutter at exact intervals of about 30 cm i.e. wet sod length. The sods are lifted off the conveyor and placed on the ground in neat symmetrical rows by workers using extra long, flat spades.

All of the excavation, macerating, spreading and sod cutting operations have been mechanised with much larger machines in Ireland - up to 5 or 12 tons of dry peat per hour from an input of perhaps 35 or 90 tons wet peat per hour. These completely mechanized, high capacity

machines are operated by two men, and each requires hundreds of hectares for efficient continuous production, and must be supported in the field by base workshops of considerable size and complexity.

By contrast, the semi-automatic macerator has minimum mechanisation - namely, a high efficient macerator with a feeder conveyor handfed and a spreader conveyor hand-emptied, with both conveyors driven from the central engine. It is simple to operate and repair in a region with very limited repair resources of any kind. Hence the supervisor must have some of the simpler garage type skills to replace chains, service the small 15 hp air cooled engine and do some welding. In the larger machines in Ireland even with excellent workshop facilities and spares available, a breakdown time of 30% is not unusual during the vital 4 months cutting season. It remains to be seen how many shutdown and lost production hours will occur for this smaller machine under Burundi conditions.

#### Production per semi-automatic machine

Operating some 200 of this type of machine in Ireland after the War under good conditions with a good team, normal outputs of 1.25 tonnes/hour dry peat were achieved from an input of about 10 cubic meters. In Burundi, with different conditions of bog and human endurance, it is thought that a group of 8 to 10 well organized men can cut about 5 cubic meters per hour, and 6 to 8 will be required to remove the sods and spread them. There could be rotation of teams also so that in the great heat men could alternate on lighter work nearby before resuming.

The feeding of the input conveyor in steady fashion with so many men around will require thoughtful organization to cut down double handling to a minimum. Double handling at the spreader end will be damaging to the very soft sods unless great care is taken. In view of the foregoing, it is calculated that the output should be reduced to 0.8 tons per hour dry peat or 6.4 cubic meters raw peat input. A period of initiation and training in planned feeding and unloading of the machine would be essential to confirm this estimate.

On the basis of 0.8 tons/hour dry peat output, and a team of 18 men (10 cutters, 8 spreaders) plus an efficient resourceful supervisor, it is calculated that the machine will travel along a cutting face at a speed of 3.65 meters per hour and a sod spread width of 16 meters - i.e. spreading behind the machine as it advances and also out for several meters beyond the conveyor end (see Exhibit 4). With a standard spread conveyor of 7 meters length, it is clear that to get proper spreading will involve the planned use of extra men to carry wet sods (by various means) out further than the end of the conveyor.



On the basis of an 8 hour/6 day week and a 20 week production season, this results in an available cutting time of 960 hours, or 768 tons per machine year at 0.8 dry peat production rate. <sup>1/</sup> If the need for peat is urgent, then cutting 10 hours per day plus work on Sundays, would increase production per season to 1088 tons. Again it may be possible to snatch an extra harvest during the small dry season by clever organization.

As the apparent density of Burundi macerated sod peat is of the order of 1.1 (i.e. 1,100 grms/liter) when dry as compared with Irish macerated sod peat of about 0.7 apparent density, then taking the lowest output of 768 tons this could increase to 1206 tons because of density alone. However, it would be prudent to allow 25% for machine breakdowns, and necessary maintenance of machines at least in the early period and this would give a production (for economic calculations particularly) of over 900 tons/annum, or 0.94 tons per hour over 960 hours.

Next comes the question of calculation of the bog area required per machine. If it is desired to cover all the available bog surface with peat then this is possible by placing cutting trenches close together, and widening spread lengths to meet the other spread peat by using even more men (or an extension conveyor section) and spread in the cutaway as it widens.

If however a lower rate of annual production is chosen so as to hold back ultimate exhaustion of the bog, then an unspread area must be allowed each harvest until, just as this area is used up by advancing machines, the cutaway area becomes available for machine travel. This is the system used for many years by Bord na Mona in Ireland and elsewhere. Some 40 machines there deliver 12 tons dry peat per hour on a production schedule of 24 hours/day and 6 days/week in a 16-20 week season. The decision as to the rate at which the bog is to be cut will be one for ONATOUR to decide.

#### B. Sod Peat Production Machines - A Comparison of Capabilities

In the realm of machine sod peat production in Ireland there are three basic machines, all of the fully automatic type. In the 100 years previously, several types of machines with a machine-driven macerator employing various amounts of human labor were used. Each had its useful production conditions. These machines were known as semi-automatics. However, only the small type is now considered for special circumstances.

In 1947, 200 of these were selected by Bord na Mona to produce macerated sod peat during a time when a rapid rise in production was required from a large number of small bogs capable of quick draining, when large

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<sup>1/</sup> An addition of rice hulls to this amount (on the basis of 15% by weight of dry sod) would increase the output to 1.1 tons/hour.

numbers of men at very low rates of pay were available, when the bogs were widely dispersed, when full coverage by spread peat of the bog area for drying was desirable and when almost no maintenance workshops existed in remote districts.

Later (circa 1954), as wages rose, workshops were built, and as the big bogs became drained Bord na Mona disposed of its 200 semi-automatics to private producers and concentrated on the larger, fully automatic sod peat machines, and on the even more automated milled peat production method for briquettes and power.

Today, Bord na Mona uses the following machines:

(1) Large Bagger (Hesepex) which is a fully tracked vehicle weighing some 50 tons, powered by electric motors aggregating some 250-300 Kw, cutting some 100 cubic metres/hour of raw peat at 89% moisture content to produce 12 tons/hour peat at 35% MC (1% ash). It works for 1,600 hours per summer season at 24 hours/day, 6 days/week and loses some 200 to 400 hours through breakdowns. The face excavation depth is usually 3 meters. Cutting trenches are up to 3 or 4 Km long. The spread width for sods varies from 54 to 60 meters. The machine is fully automatic requiring only a driver to steer and adjust and a helper.

To attain 80% usage of available time by these machines has taken years of experience. A workshop of considerable size is available and must carry lathes, milling machines, welding machines, roll benders, cutters, spare parts stores, etc. The estimated annual production is 20,000 tons. The cost of the machine is over \$500,000.

(2) The other two types of smaller bagger machines in use are similar in many ways but differing principally in the peat cutting method used.

They are:-

(a) Miniput machine which has a vertical cutting head sloping forward and (b) Lilliput machine which has a cutting head which slopes at an angle of 45° to the facebank and is used where facebanks may collapse into the cutaway if the bog is wet or if the peat is not well bound together by fibre.

Bord na Mona uses 4 of these Lilliput machines for its bogs in mountainous areas. The Miniput machine is used in shallower bogs and where the top surface is also macerated with the peat without serious ill effects. In each case, the machines produce from 4 to 5 tons of dry peat per hour. These machines cost about \$90,000 each (without essential workshop facilities). The machine is powered by a 90 HP diesel engine and requires long face banks to get best production and to minimize breakdown due to the strain on machine parts at turns. In Ireland, some 20 or so Miniputs are used by private producers, widely dispersed. The machines average 30 - 40% breakdown time. Some local support workshop help is available, but they all depend for serious part failure on the manufacturer's workshop. The crew is usually 1 driver and 1 helper.

### C. Production Alternatives

Three flow lines sheets (A, B, and C) illustrate the various alternative production paths for peat in Burundi.

#### Flow Sheet A - Highland Bogs

This flow sheet shows the basic production methods for macerated sod peat using the simple semi-automatic macerator. This is the recommended way to begin.

If at any stage of the development in the future production cycle it can be shown that macerated sod peat is not viable for either production or sales reasons, then the alternative of "milled peat" can be used. This will involve fairly simple field production techniques with high labor content but has a rather sophisticated briquetting press system as a necessary final step. As it cannot be guaranteed that "milled peat" will be air-dried down to the desirable 15% moisture content level, then a simple dryer (using 10-15% of the milled peat as fuel to provide heat for drying) must be added.

A prototype briquetting plant using the equipment that would be proposed for a milled peat briquetting plant will be in operation in Ireland at the end of 1980, for producing 20,000 tons of briquettes from wood refuse (sawdust, chips, bark, forest thinnings etc.) of 50% moisture content. This plan can be used for exhibition or for any tests required on milled peat briquetting, in the event that this technique may be necessary for Burundi. Such small peat briquette plants were common in Denmark and elsewhere during and after World War II. One was operated in Ireland by Bord na Mona. The technique of milled peat briquetting is well known, but is more complicated than producing macerated sod peat. For that reason, sod peat is more suited to Burundi at least until logic and extra data forces a re-examination of the matter.

#### FLOW SHEET B

##### B1 Flowline

Growing high density wood biomass is a possible local bog site activity. This wood, when disintegrated by hammer/screen mill or by high labor machete and screen, can be added to wet peat using a macerator, to act as an additive to sod peat; in the peat briquetting process it can also be added to peat and be briquetted as a mixture.

An advantage of either process is that since wood ash percentage is low and its calorific value high, then peat with higher ash and lower caloric value, can be usefully improved by the percentage of additive used. There is an upper limit to the percentage of additive, but this will have to be determined in practice. As a guide it is probable that approximately 25% can be added.

Another attractive and plentifully available additive which could help the economy would be coffee or rice hulls. These could be brought to the bog by returning empty lorries from Bujumbura or other places where piles of such hulls would be obtainable. Some improvement in the cost of production could be obtained by using such additives, depending on the efficiency of collection and use.

#### B2 Flowline - Use of Reeds as additive

It is stated that reeds can be more productive in terms of solids per hectare per unit time than wood. Therefore, if such reeds are harvestable locally, these could be dried, disintegrated and used as an additive in sod or briquette production. Again this could help the local economy.

#### B3 Flowline - Roots of Papyrus

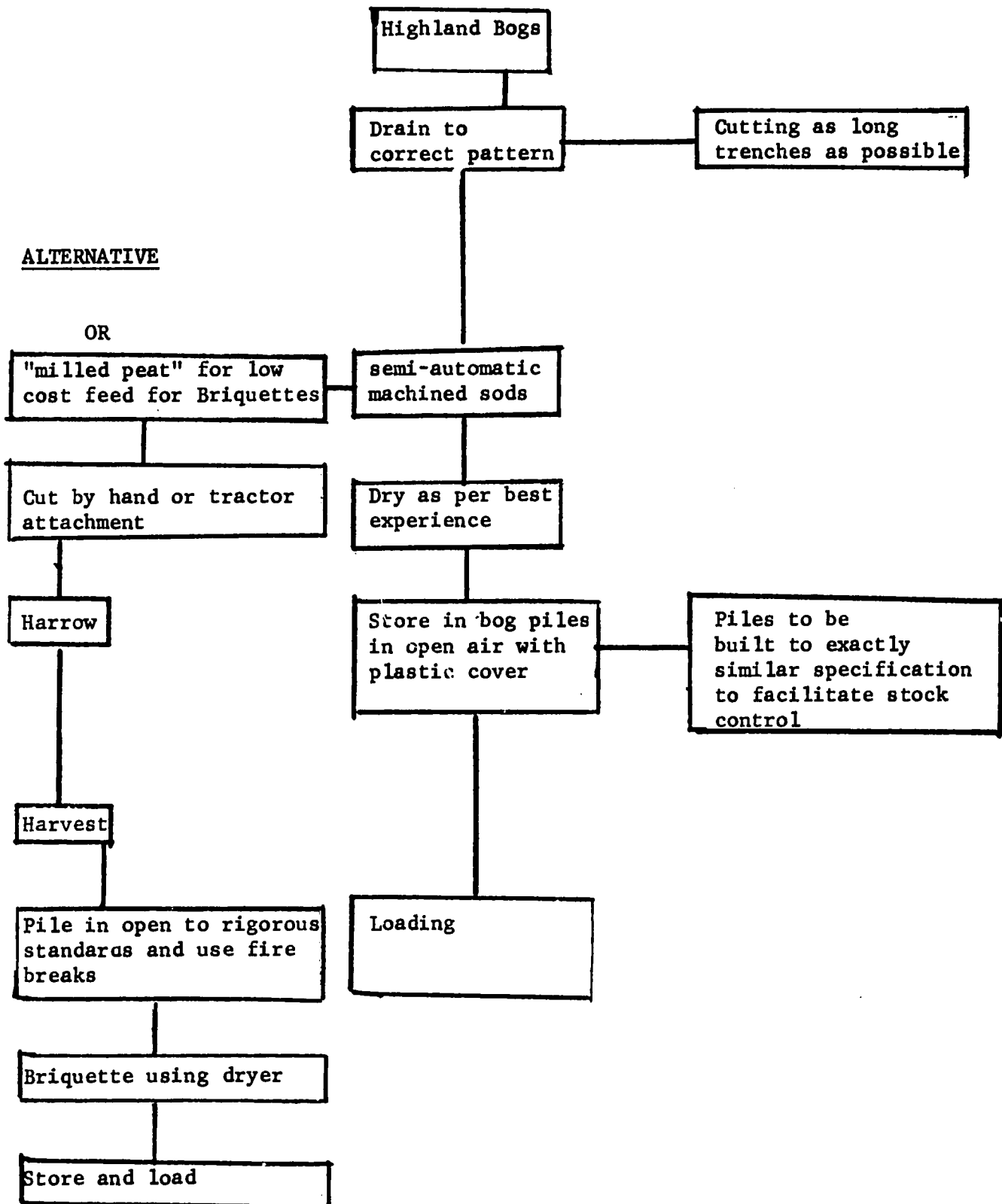
The roots of papyrus can be cut by knife into pieces (30 cm X 30 cm X 15 cm) and dried in hot sunshine in about 2 to 3 weeks. This dry material when shredded (disintegrated) is of the same value as European moss peat for soil improvement. It absorbs seven times its own weight of water when dry and provides excellent air/water ratio conditions for root growth when mixed with heavy soil.

This material could be used locally for the purpose stated. If required at greater distances, then briquetting is technically feasible without difficulty; this increases the specific density from 0.1 to 1.2.

#### FLOW SHEET C - GRAND MARAIS

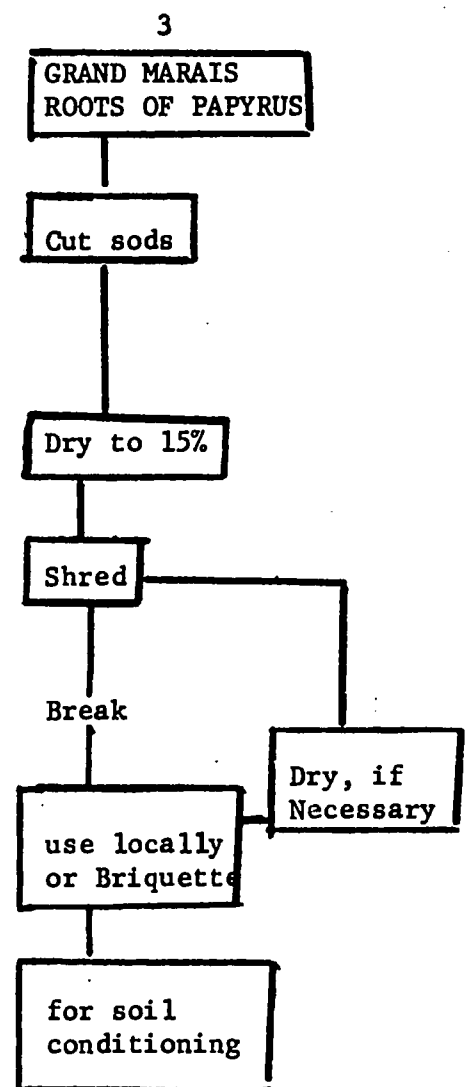
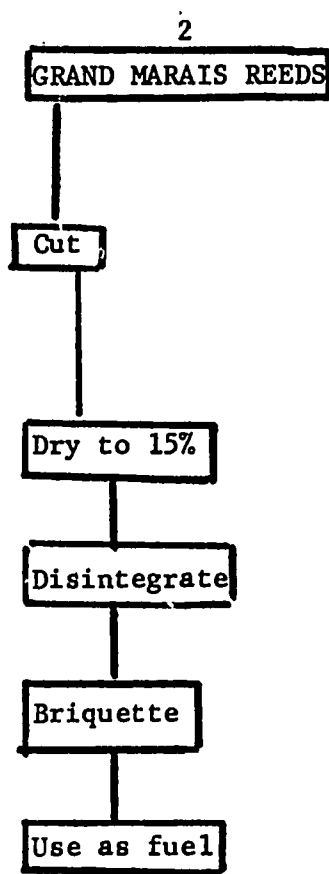
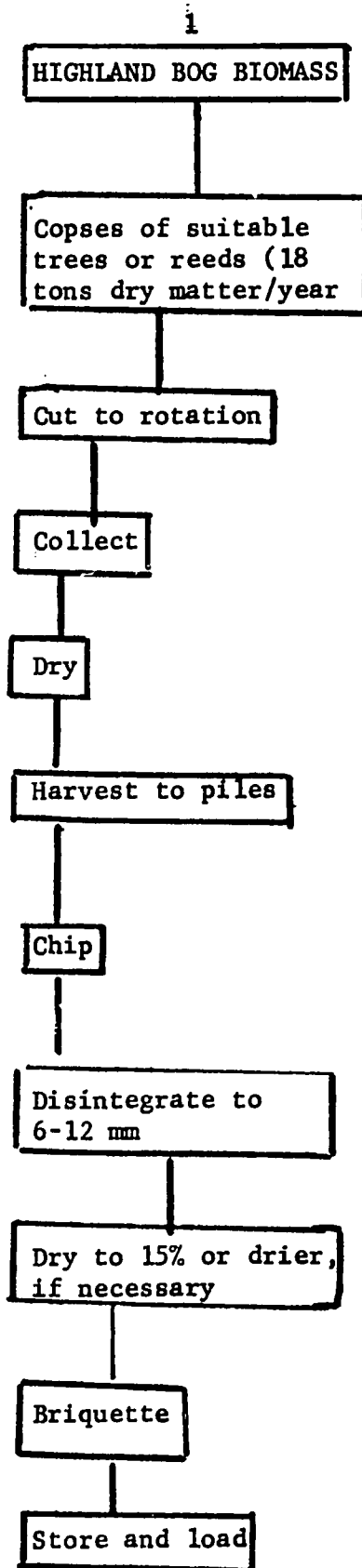
As the Grand Marais will be of serious interest in the future, it would be prudent to arrange that a small typical area be selected soon for test exploitation. The initial tests need only be pursued at hand maceration level so as to determine and demonstrate the basic production methods required. These are shown on the flow sheet.

FLOW CHART A

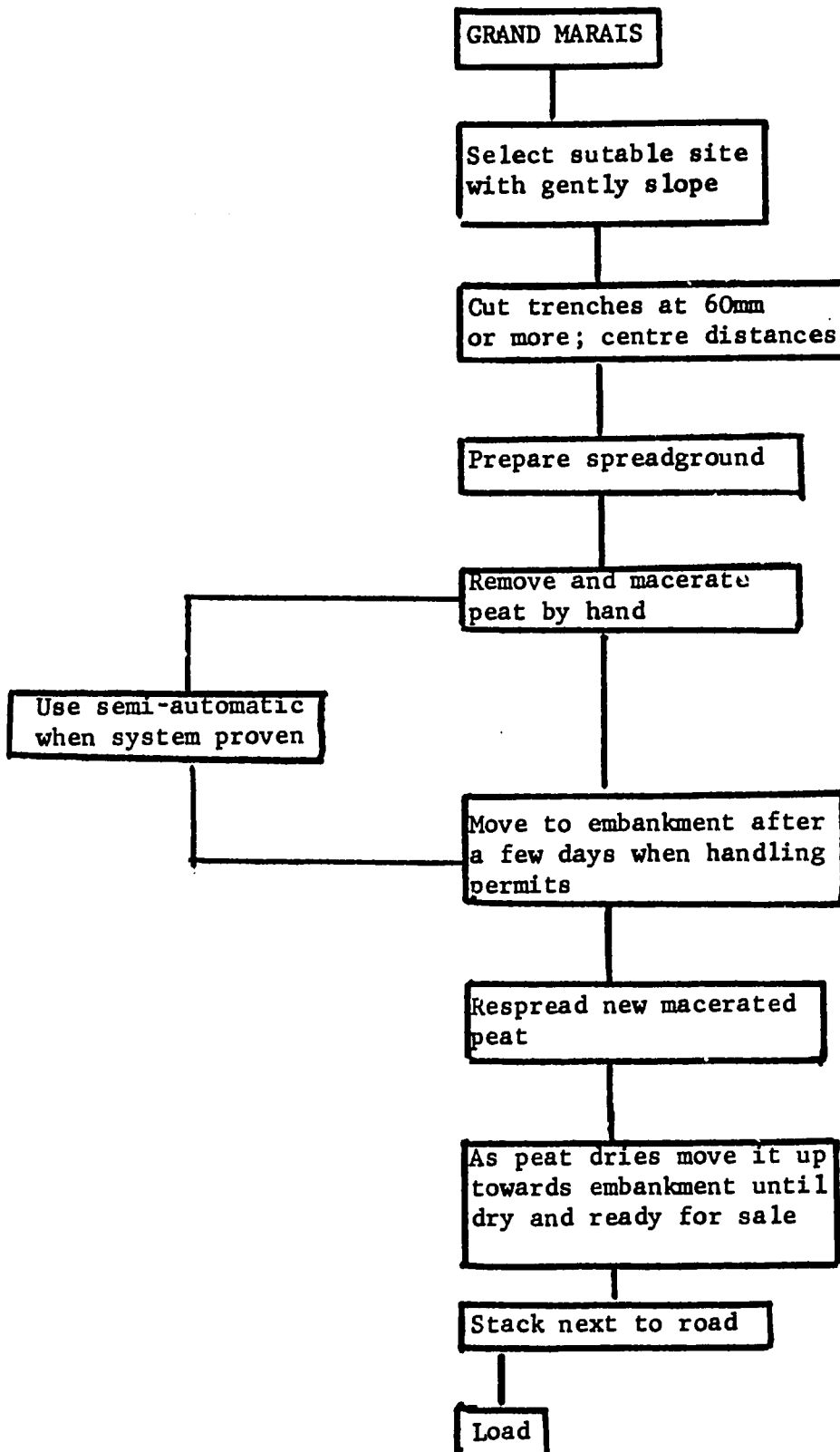


FLOW CHART B

ANNEX C  
Exhibit 1  
Page 8 of 9



FLOW CHART C



BURUNDI: PEAT II PROJECT  
Comparison of Peat Production Machinery

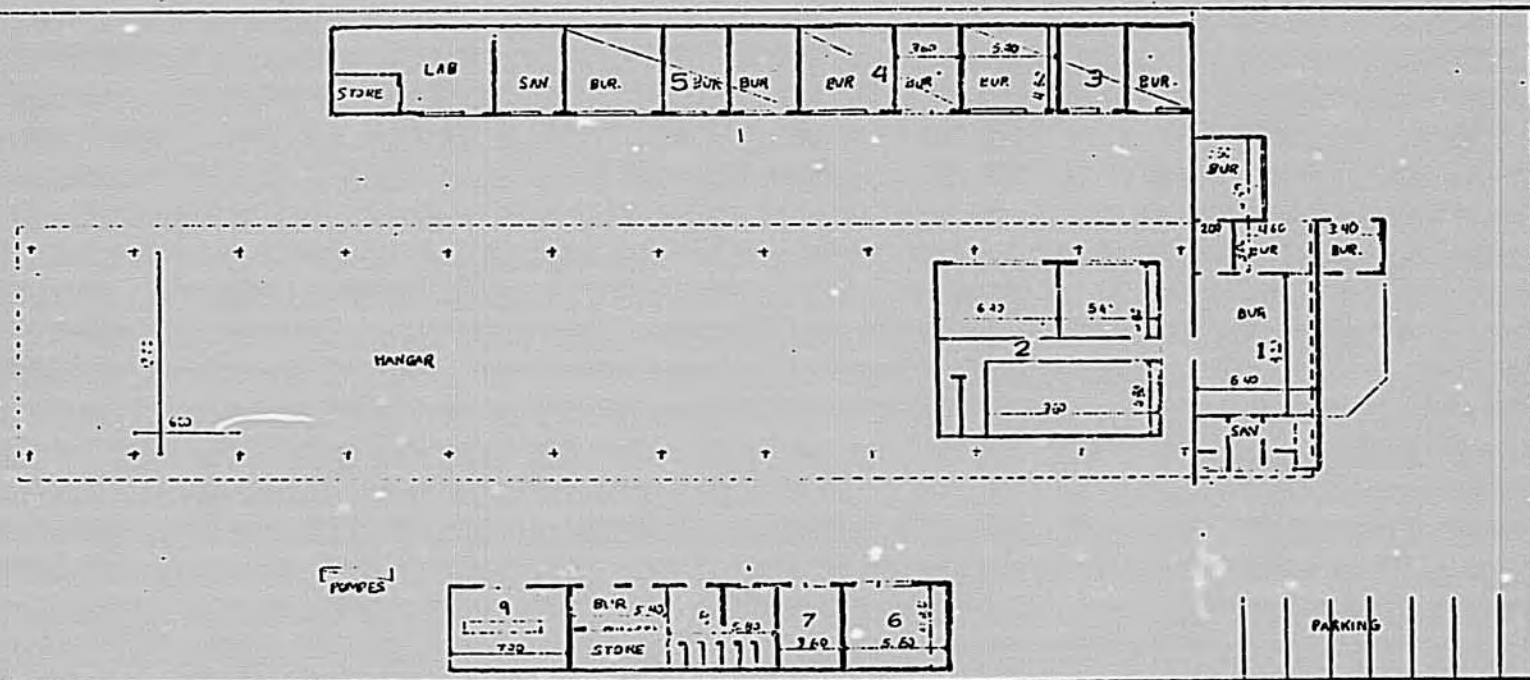
Machine	Unit Cost (\$)	Life Expectancy (years)	Output (tons p/a)	Manpower Required	Fuel Requirements (per hour)	General Level of Skills Required	
						Operation	Maintenance
1. Large Bagger	500,000	10	20,000	2 (1 driver 1 helper)	250 Kw	Lg. lorry driver, labourer	Skilled mechanics, welders, machinists
2. Miniput	90,000	10	3,500	2 (1 driver 1 helper)	4.5 Imp. Gals. Diesel	Lorry driver; labourer	Skilled mechanic plus welding and machine tool capability
3. Semi-Automatic	20,000	10	1,250 (Ireland)  768-1100 (Burundi)	19 (1 supervisor 10 feeders 8 spreaders)	.75 Imp. Gals. Diesel	Vehicle driver; labourer	Partial time- skilled mechanic



BURUNDI: PEAT II PROJECT

ANNEX C  
EXHIBIT 3

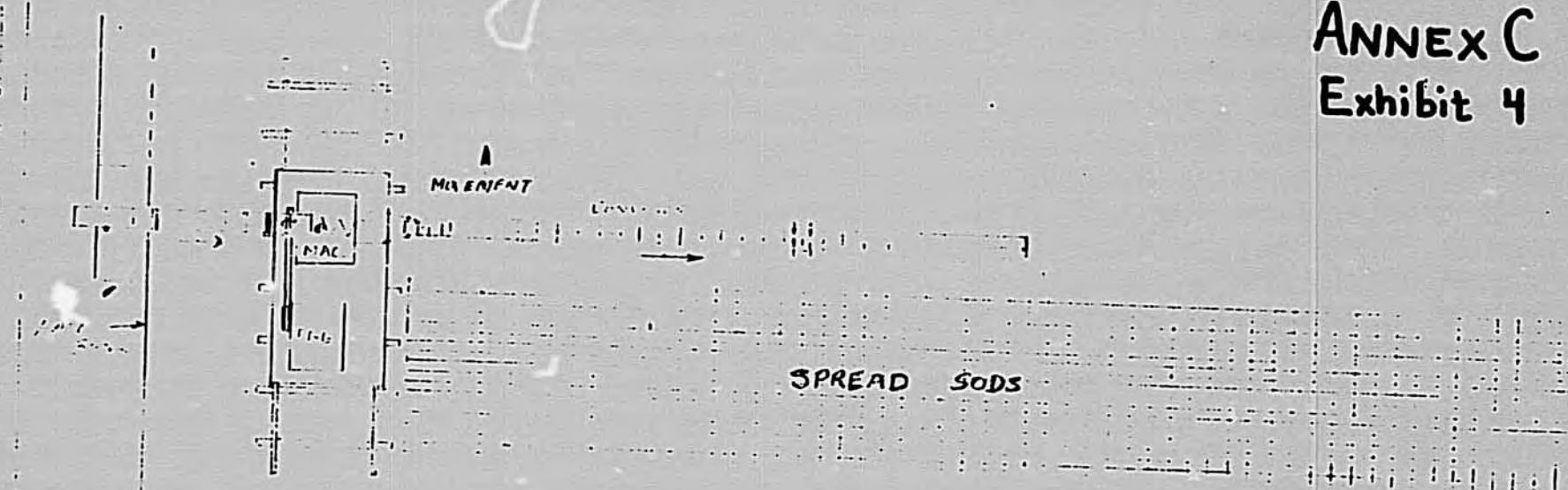
REVISED  
PLAN DES CONSTRUCTION  
ONATOUR



- 1 ADMINISTRATION
- 2 ENTREPRENEUR
- 3 FINANCES
- 4 COMMERCE - SATIN
- 5 EXPEDITION
- 6 STORE
- 7 LOCAL PERSONNEL
- 8 SANITAIRES
- 9 GARAGE
- 10 CONTRÔLE

# ANNEX C

## Exhibit 4



### SEMI-AUTOMATIC PEAT MACHINE.

(Mechanical Maceration, Hand Fed,  
Hand Spread.)



ANNEX E  
Exhibit 1

Burundi Peat II Project  
Projected Profit and Loss Statement  
(in \$000s)

	1980 \$26.67/MT	1981 \$30.00/MT	1982 \$31.50/MT	1983 \$33.08/MT	1984 \$34.73/MT	1985 \$36.47/MT	1986 \$38.29/MT	1987 \$40.20/MT	1988 \$42.21/MT	1989 \$44.32/MT	1990 \$46.53/MT	TOTAL
	SALES PRICE											
Projected Production in MTs	6,300	12,500	20,441	29,855	38,000	47,500	52,200	57,000	59,300	59,300	59,300	
Revenue (Sales)	\$ 168	\$ 360	\$ 614	\$ 958	\$1,290	\$ 1,702	\$ 1,969	\$ 2,261	\$2,473	\$2,598	\$2,729	\$17,122
Production Costs	(123)	(298)	(366)	( 530)	( 684)	( 858)	(1,014)	( 1,139)	(1,240)	(1,294)	(1,346)	( 8,882)
Gross Margin	\$ 45	\$ 62	\$ 248	\$ 428	\$ 606	\$ 844	\$ 955	\$ 1,122	\$1,233	\$1,304	\$1,383	\$8,240
Administrative Costs	( 237)	( 312)	( 354)	( 386)	( 403)	( 426)	( 448)	( 470)	( 491)	( 515)	( 588)	(4,630)
Net Profit (Loss) from Operations	(\$192)	(\$ 250)	(\$106)	\$ 42	\$ 203	\$ 418	\$ 507	\$ 652	\$ 742	\$ 789	\$ 795	\$3,610
Less Depreciation	( 36)	( 73)	( 154)	( 214)	( 231)	( 280)	( 309)	( 333)	( 342)	( 344)	( 354)	(2,670)
Net Profit (Loss)	(\$228)	(\$323)	(\$260)	(\$172)	(\$ 28)	\$ 138	\$ 198	\$ 319	\$ 400	\$ 445	\$ 441	\$ 940
Cumulative Net Profit (Loss)	<u>(\$228)</u>	<u>(\$551)</u>	<u>(\$811)</u>	<u>(\$983)</u>	<u>(\$1,011)</u>	<u>(\$ 873)</u>	<u>(\$ 675)</u>	<u>(\$ 356)</u>	<u>\$ 44</u>	<u>\$ 489</u>	<u>\$ 930</u>	

Burundi Peat II Project  
Projected Cash Flow Statement  
(\$000's)

Annex E  
Exhibit 2

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Beginning Balance, Cash	\$56	\$ 87	\$214	\$367	\$612	\$777	\$1173	\$1511	\$1996	\$2625	\$3238
Net Profit or (Loss) before depreciation	(192)	(250)	(106)	42	203	418	507	652	742	789	795
GRB Contribution to Operating Costs	228	323	260	172	28	-	-	-	-	-	-
AID Contribution		64	27	41	32	18	-	-	-	-	-
Investment In:											
Other Current Assets (1)	(5)	(10)	(20)	(10)	(10)	(10)	(10)	(5)	-	-	-
New Equipment	-	-	-	-	-	-	(150)	(120)	(60)	-	-
Replacement Equipment	-	-	(8)	-	(88)	(30)	(9)	(42)	(53)	(176)	(519)
Ending Balance, Cash	<u>\$87</u>	<u>\$214</u>	<u>\$367</u>	<u>\$612</u>	<u>\$777</u>	<u>\$1173</u>	<u>\$1511</u>	<u>\$1996</u>	<u>\$2625</u>	<u>\$3238</u>	<u>\$3514</u> (2)

(1) Accounts receivable will increase as sales volume increases.

The inventory of supplies and tools also will increase.

(2) Cash needed for (a) expansion of operations to include the Grand Marais,  
and (b) replacement of vehicles and equipment estimated at \$680,000 in 1991  
and \$430,000 in 1992.

Burundi: Peat II Project  
Financial Plan - 1980-1985  
(in \$000s)

A.I.D.	1980	1981	1982	1983	1984	1985	Total
1. Technical Assistance (31 years long-term 36 months short-term) <sup>1/</sup>	\$ -	\$959	\$1,237	\$1,238	\$1,168	\$ -	\$4,602
2. Vehicles and Equipment							
Macerating Machines (45)	\$ -	108 (3)	433 (17)	255 (10)	179 (7)	204 (8)	1,179
Pick-up trucks (9)	-	36 (3)	12 (1)	60 (5)	-	-	108
Truck - 10 ton (1)	-	-	-	56 (1)	-	-	56
PortaVan (1)	-	25 (1)	-	-	-	-	25
Lab Equipment <sup>2/</sup>	-	-	8	-	-	-	8
Office Equipment/Furniture <sup>2/</sup>	-	-	97	-	-	-	97
Residential Furniture (9)	-	77 (7)	22 (2)	-	-	-	99
Mechanics Tools <sup>2/</sup>	-	9	11	9	-	-	29
Peat Production Tools <sup>3/</sup>	-	38	4	5	5	-	52
3. Demonstration and Promotion							
Low-cost Stoves (1000)	-	10	10	-	-	-	20
Demonstrations/Publicity	-	30	30	15	5	-	80
4. Training (in-country plus 24 months third country)	-	15	20	30	30	15	110
5. Construction							
ONATOUR offices	-	130	130	-	-	-	260
6. Other							
POL <sup>4/</sup>	-	17	12	27	27	18	101
ONATOUR Office Rental (up to 18 months)	-	30	30	-	-	-	60
Technician Housing Rental <sup>5/</sup> - Note	-	66	86	70	70	-	292
7. Inflation and Contingency <sup>6/</sup>		166	261	193	137	65	822
<b>Total A.I.D.</b>	-	\$1,716	\$2,403	\$1,958	\$1,621	\$302	\$8,000
<u>GRB</u>							
8. Land (ONATOUR Office Site)	78	-	-	-	-	-	78
9. ONATOUR Operating Shortfall (1980-84) <sup>7/</sup>	228	323	260	172	28	-	1,011
<u>Government of Ireland (GOI)</u>							
10. Bord na Mona	\$306	\$323	\$260	\$172	\$28	\$ -	\$1,089
11. Unassigned	100	125	-	-	-	-	225
<b>Total GOI</b>	\$406	\$448	\$260	\$172	\$28	\$ -	\$1,314
<u>IBRD</u>							
12. Technical Assistance- Stove Design	10	25	-	-	-	-	35
<b>Total Project</b>							<b>\$10,549</b>

NOTES TO FINANCIAL PLAN

- ( ) Denotes quantity  
<sup>1/</sup> See Annex B, Exhibit 5  
<sup>2/</sup> See Annex B, Exhibit 6  
<sup>3/</sup> See Annex 4, Exhibit 7  
<sup>4/</sup> POL for 3 macerating machines for 1 year and for 9 pick-up trucks for the life of the project.  
<sup>5/</sup> Bujumbura-2 house rentals for 4 years; 1 house rental for 2 years; total 10 house rental years.  
    Bogs - 4 house rentals for 4 years; 1 rental for 3 years; 1 house rental for 2 years; total 21 house rental years.  
<sup>6/</sup> Inflation calculated at 15% per annum compounded for all items except Technical Assistance (TA has inflation factor built in); Contingency calculated at a straight 5% per annum.  
<sup>7/</sup> See Annex E, Exhibit 1 for net losses for years 1980-1985. The Projected P&L Statement (Annex E, Exhibit 1), of course, shows both inflated costs and revenues.

Burundi: Peat II Project  
Unaudited 1979 Balance Sheet and Projected 1980-90  
(in \$000's)

Annex E  
Exhibit 4

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
<b>Assets</b>												
Current	\$109	\$ 145	\$ 282	\$ 455	\$ 710	\$ 885	\$1,291	\$1,639	\$2,129	\$2,758	\$3,371	\$3,647
Land		78	78	78	78	78	78	78	78	78	78	78
Fixed Assets	385	385	631	1,211	1,582	1,849	2,083	2,242	2,404	2,517	2,693	3,212
Less Depreciation	(43)	(79)	(152)	(306)	(520)	(751)	(1,031)	(1,340)	(1,673)	(2,015)	(2,359)	(2,713)
Net Fixed Assets	\$342	\$ 306	\$ 479	\$ 905	\$1,062	\$1,098	\$1,052	\$ 902	\$ 731	\$ 502	\$ 334	\$ 499
<b>Total Assets</b>	<u>\$451</u>	<u>\$ 529</u>	<u>\$ 839</u>	<u>\$1,438</u>	<u>\$1,850</u>	<u>\$2,061</u>	<u>\$2,421</u>	<u>\$2,619</u>	<u>\$2,938</u>	<u>\$3,338</u>	<u>\$3,783</u>	<u>\$4,224</u>
<b>Liabilities</b>												
Current	\$ 8	\$ 8	\$ 8	\$ 8	\$ 8	\$ 8	\$ 8	\$ 8	\$ 8	\$ 8	\$ 8	\$ 8
<b>Equity</b>												
Capital Contributions <sup>1/</sup>	\$458	\$ 536	\$ 846	\$1,445	\$1,857	\$2,068	\$2,290	\$2,290	\$2,290	\$2,290	\$2,290	\$2,290
GRB Operating Subsidies <sup>2/</sup>	238	466	789	1,049	1,221	1,249	1,249	1,249	1,249	1,249	1,249	1,249
Total Contributed Capital	\$696	\$1,002	\$1,635	\$2,494	\$3,078	\$3,317	\$3,539	\$3,539	\$3,539	\$3,539	\$3,539	\$3,539
Accumul. Earnings (Deficit) <sup>3/</sup>	(253)	(481)	(804)	(1,064)	(1,236)	(1,264)	(1,126)	(928)	(609)	(209)	236	677
Net Equity	\$443	\$ 521	\$ 831	\$1,430	\$1,842	\$2,053	\$2,413	\$2,611	\$2,930	\$3,330	\$3,775	\$4,216
<b>Total Liabilities &amp; Equity</b>	<u>\$451</u>	<u>\$ 529</u>	<u>\$ 839</u>	<u>\$1,438</u>	<u>\$1,850</u>	<u>\$2,061</u>	<u>\$2,421</u>	<u>\$2,619</u>	<u>\$2,938</u>	<u>\$3,338</u>	<u>\$3,783</u>	<u>\$4,224</u>

- <sup>1/</sup> Equity-Capital Contributions: Adjusted for value of AID contributions (macerating machines, vehicles, hand-tools, POL, etc and GRB contribution of land.
- <sup>2/</sup> Equity-GRB Operating Subsidies: Adjusted for funds provided by GRB to cover operating expenses.
- <sup>3/</sup> Equity-Accumulated Earnings: Adjusted for net profit or (loss) from operations, after depreciation.

## ANNEX F - ECONOMIC ANALYSIS EXHIBITS

Annex F  
Exhibit 1

### EXHIBIT 1: Analysis of Energy Availabilities and Usage in Burundi

Given the resources currently available in Burundi, the country faces a dilemma in meeting its requirements for food and fuel from the same land area. Although some energy is available from hydro-electric power (primarily coming from a dam located in Zaire) as well as Burundi's own considerable potential for geomistic hydro-electric generation, this cannot be viewed as either a short-or even medium-term solution for the majority in the country. The requirements for heating, cooking, artisanal and some types of industrial production will have to be met by wood products (firewood or charcoal) for some time to come given the very large capital costs of dams, generating equipment, a national electrification grid and consumer appliances.

Due to the demand for wood supplies, Burundi has been steadily reducing its tree cover. The figure currently used in most estimates of tree cover--3 percent of the land area-- appears to be too low as it only covers substantial forest areas and communal plantations. A figure closer to 6 percent is probably more nearly correct if private woodlots and trees are taken into consideration. This figure suggests an availability of 162,000 hectares of trees. As most of this area is unmanaged, it would produce a mean annual increment of approximately five tons of wood per hectare, or a total of 810,000 tons of wood per annum.

Estimates of wood usage for fuel vary greatly from a high of 2 steres<sup>1/</sup> per capita (3.2 million tons per year) to a low of 0.5 steres per capita (80,000 T of wood). To this must be added the amount used for construction, which is estimated at 300,000 m<sup>3</sup> or 180,000 tons of wood per annum. As can be seen, this latter requirement plus even the lowest estimate of fuel use outstrips the annual incremental availabilities of cropped wood. As a result, available woodlands are currently being reduced at the rate of at least 10,000 hectares (this assumes that clearcutting produces 24 tons of wood per hectare ) and by an accelerating amount in future years as the population increases and the agricultural area expands and the trees available for cropping are reduced.

Consideration must also be given to the problems which are arising from a steady loss of tree cover. Burundi's current tree cover is much lower than those of heavily populated European countries (which have about 20 percent tree cover) where wood is not used extensively as a fuel. If the environment is to be protected, and fuel/building material requirements met, the tree cover needs to be built up to a figure closer to 25 per cent. Otherwise problems of soil degradation and erosion (which are already in evidence) will compound the difficulties already faced in conforming the growth of agricultural production to that of population growth. A strenuous program of tree planting coupled with a reduction in pressure on wood supplies is needed if this goal is to be achieved.

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<sup>1/</sup>One stere equals roughly one cubic meter of stacked wood.



Clearly, for the present, the choice for Burundi in meeting the gap between fuel availabilities and needs is reduced to the development of its peat resources or the importation of fuels such as kerosene for domestic cooking. Peat has the advantage over trees in that it is an already existing resource while new trees plantings take several years to reach exploitable size. If peat is to make its maximum contribution to the protection of the forests, it should be used in a way which replaces the maximum amount of wood usage. Analysis of various types of fuel use suggests that the most important market in this regard is the domestic urban market which primarily consumes wood in the form of charcoal.

The charcoal market in Bujumbura in 1980 is estimated at 14,700 MT. Since the method used to convert wood to charcoal is highly inefficient, that tonnage of charcoal represents about 100,000 MT of wood, or approximately 10 percent of Burundi's estimated annual consumption. Given that the Bujumbura population is only 4 percent of the total population, the consumers of charcoal are using a very disproportionate share of the available fuel. If the portion of wood usage in terms of charcoal could be replaced, forest destruction (clear-cutting) could be reduced by 4300 hectares per year. By contrast, if a similar amount of peat was used to replace the wood used directly by consumers (such as schools or brick-makers), it would protect only 1,100 hectares of wood from destruction.

Without the project, the tree cover in Burundi would be reduced to less than half its current size by 1985, and to approximately one-quarter by 1986. This situation is expected to be ameliorated by tree planting programs to establish 22,000 hectares of new trees during the period of the Third Five-year Development Plan. This will cost on the order of \$8.8 million, 35 percent of which is foreign exchange. Several external donors including the World Bank and F.E.D. are assisting this effort, and AID is considering providing financial support to establish wood plantations to protect the Bururi Forest. Even if this rate of plantings continues through 1985, only 51,300 hectares will remain in 1986, or 32 percent of present availabilities.

If the recommended usage of peat is carried through by ONATOUR, peat produced under the project should protect 8,200 hectares of trees, leaving about 60,000 hectares in 1986. In addition, the phasing of availabilities may make it possible to crop a greater area of forest rather than clear cutting in earlier years, thus leaving an even greater area. However, at this point, peat represents only a partial solution to Burundi's energy needs, and this fact still confronts Burundi's development planners.

BURUNDI: PEAT II PROJECT  
PRODUCTION SCHEDULE FROM PROJECT BOGS  
PRODUCTION PLANNED TO PRESERVE FUEL AVAILABILITIES IN  
REGIONAL CENTERS WITH 15%, ADDITION OTHER FUELS  
(tons)

	<u>Kashiho</u>	<u>Kurinyange</u>	<u>Kishubi</u>	<u>Kitanga(a)</u>	<u>Kitanga(b)</u>	<u>Nyaciijima</u>	<u>Total</u>	<u>Other Organic Fuel Addition</u>	<u>Total</u>
Previous									
Years	2,800	1,800	-	-	-	-	4,600	-	4,600
1980	2,500	2,300	1,500	-	-	-	6,300	-	6,300
1981	3,375	4,000	2,500	1,000	1,000	-	11,875	625	12,500
1982	3,375	5,000	4,000	2,000	2,000	1,000	17,375	3,066	20,441
1983	3,375	6,000	6,000	4,000	4,000	2,000	25,375	4,480	29,855
1984	3,375	6,000	8,000	6,000	6,000	3,000	32,375	5,625	38,000
1985	3,375	6,000	8,000	9,000	9,000	5,000	40,375	7,125	47,500
1986	3,375	4,000	8,000	11,000	11,000	7,000	44,375	7,825	52,200
1987	3,375	4,000	8,000	11,000	13,000	9,000	48,375	8,625	57,000
1988	3,375	4,000	8,000	11,000	13,000	11,000	50,375	8,925	59,300
1989	3,375	4,000	8,000	11,000	13,000	11,000	50,375	8,925	59,300
1990	3,375	4,000	8,000	11,000	13,000	11,000	50,375	8,925	59,300
1991	3,375	4,000	8,000	11,000	13,000	11,000	50,375	8,925	59,300
1992	3,375	4,000	8,000	11,000	13,000	11,000	50,375	8,925	59,300
1993	3,375	4,000	8,000	11,000	13,000	11,000	50,375	8,925	59,300
1994	825	4,000	8,000	11,000	13,000	11,000	50,375	8,925	59,300
1995	-	4,000	8,000	11,000	13,000	11,000	47,825	8,475	56,300
1996	-	4,000	8,000	11,000	13,000	11,000	47,000	8,300	55,300
1997	-	4,000	8,000	11,000	13,000	11,000	47,000	8,300	55,300
1998	-	4,000	8,000	11,000	13,000	11,000	47,000	8,300	55,300
1999	-	4,000	8,000	11,000	13,000	2,000	38,000	6,700	44,700
2000	-	4,000	8,000	11,000	13,000	-	36,000	6,400	42,400
TOTAL	50,000	91,100	150,000	187,000	215,000	150,000	843,100	145,696	988,796
TOTAL Availability	50,000	140,000	153,000	228,000	300,000	150,000	1,021,000		
Total remaining at end 20 years	-	48,900	3,000	41,000	85,000	-	177,900		

## EXHIBIT 2: ANALYSIS OF PROJECT BENEFITS

Annex F  
Exhibit 2

### A. Domestic Market Case

#### 1. Peat Production

In the domestic market case the peat produced has been valued in terms of the price required to achieve the financial viability of ONATOUR by 1985, 2,700 FBu per ton in 1981. This figure was deflated by 5 percent to put it in 1980 prices. Accordingly, peat production was valued at 2571 FBu (\$28.57) per MT, and the value calculated for the year of production. It was decided that ONATOUR would use the minimum feasible price since it is important to keep the sales price of peat as close to the wood equivalent as possible to avoid distorting the cost position of artisanal, industrial and institutional users.

#### 2. Increased Rural Incomes

It has been estimated that 50 percent of the salary costs of the bog workers represents an increased income flow into the areas around the bog sites, which is a benefit from the planned use of labor intensive method of production. This calculation has been based on the difference between the average productivity per worker in the agricultural sector (the "without project" situation) and the wage paid to the bog laborers ("with project"). Several categories of workers will be employed on the job; accordingly, their average salary was calculated and found to be twice the daily productivity in the agricultural sector (estimated at 51 FBu in 1980). Work supervisors earn a higher rate of pay, but it was

assumed they would be earning more than the minimum wage in the agricultural sector. Their incremental income has also been calculated as 50 percent of wages received.

This income benefit has been used to represent the economic gains resulting from increased productivity and the multiplier effects of the income flow into the area. It is a conservative estimate as it is only based on the value of the income stream provided by employment on the bogs. Given the high marginal propensity to consume in a subsistence agricultural community, it is likely that the multiplier effect of the extra income will be significantly higher. Social analysis carried out in the course of project preparation at two areas where production is already underway indicated that wages were being spent on consumption items such as food, banana beer and household utensils, which will further increase local incomes within the rural community. In addition, there is already evidence that the workers on the bogs are paying other local men to assist their families in agricultural work, thus creating a secondary source of employment.

It has been recognized that the intended use of peat to replace charcoal will have an impact on the rural producers of charcoal. However, analysis of the charcoal production/marketing chain indicates that the most substantial profits are made by transporters or by the limited numbers of persons who receive permits to produce large amounts of charcoal. Rural producers

and persons who work for transporters/producers receive only the minimum wage equivalent for their work. Any impact peat sales will have on them has been judged to be offset by the secondary effects of the peat availabilities. These are not only the multiplier effects mentioned above, but also include the plans to stimulate lime and brick production and related services (construction) in rural areas which will become possible when increased fuel supplies are available. Other persons involved in the charcoal production/sales chain may be able to recoup their losses by transporting/marketing peat, although they may not make the same profit margins.

3. Consumer Surplus (See Table I in this Annex)

The urban poor in Bujumbura (50 percent of the residents in the city are estimated to be below the poverty line) have been adversely effected by steadily escalating costs of fuel for cooking. Peat production and careful planning of transport requirements for peat production (discussed in Exhibit 3) will make it possible to meet their fuel needs at significantly lower cost. Accordingly, the bog price of peat plus the amount required to transport peat to Bujumbura have been totalled and a 25 percent mark-up calculated to cover handling and retailing costs. This price has been used as the estimated price of peat to the consumer (the "with project" situation).

In the "without project" situation, it is a safe assumption that the price of charcoal would not increase at the same rate as

**BURUNDI: PEAT II PROJECT**  
**TABLE I**  
**CONSUMER SURPLUS (1980 PRICES)**

WITHOUT PROJECT

WITH PROJECT

	(1) Price of Charcoal per ton (FBu <sup>a/</sup>	(2) Price per ton (\$US)	(3) Charcoal Equivalent of Peat Purchased (MTs)	(4) Total Price (\$US)	(5)	(6) Price of a ton of Peat (FBu)	(7) Cost per ton tran- sport (FBu)	(8) Retail Price (6) X 1.25 (FBu)	(9) \$US Equi- valent (8)	(10) Amount Purchased (MTs)	(11) Value (\$US)	(12) Consumer Surplus (4)- (11) (\$US)
1981	27,000	300	726	217,800		2571	2200	5963	66	1800	118,800	99,000
1982	29,000	322	2,339	753,158			3572	7679	85	5800	493,000	260,158
1983	32,000	356	4,072	1,449,632			3921	8115	90	10100	909,000	540,632
1984	36,000	400	6,895	2,758,000			4,502	8,841	98	17,100	1,679,837	1,078,162
1985	43,000	478	10,887	5,203,986			4,899	9,338	104	27,000	2,801,250	2,402,736
1986	43,690	485	13,407	6,502,395			5,126	9,621	107	33,250	3,554,517	2,947,878
1987			16,169	7,841,965			5,222	9,741	108	40,100	4,330,800	3,511,165
1988			17,056	8,272,160			5,227	9,748	108	42,300	4,568,400	3,703,760
1989			17,984	8,722,240			5,230	9,751	108	44,600	4,816,800	3,905,440
1990			18,952	9,191,720			5,243	9,767	108	47,000	5,076,000	4,115,720
1991			20,040	9,719,400			5,257	9,785	109	49,700	5,417,300	4,302,100
1992			21,129	10,247,565			5,263	9,792	109	52,400	5,711,600	4,535,965
1993			22,056	10,697,160			5,273	9,805	109	54,700	5,923,300	4,734,860
1994			21,210	10,286,850			5,383	9,944	110	52,600	5,786,000	4,500,850
1995			20,443	9,914,855			5,474	10,056	112	50,700	5,678,400	4,236,455
1996			20,443	9,914,855			5,474			50,700	5,678,400	4,236,455
1997			20,443	9,914,855			5,474			50,700		
1998			20,443	9,914,855			5,474			50,700		
1999			17,573	8,522,905			5,497	10,085	112	50,700		
2000			15,520	7,527,200			5,537	10,135	113	43,580	4,880,960	3,641,945
										38,490	4,349,370	3,177,830

<sup>a/</sup> Given the progressive decrease in wood availabilities, it has been assumed that the price of charcoal would increase at a rate greater than general inflation due to increasing scarcity and further transport distances. This rate has been taken to be the percentage drop in forest reserves in the year previous to the increase. By 1986, wood availabilities would not support charcoal production, so it has been assumed that charcoal users would be converted to kerosene. The 4369 price per ton shown is the KCal equivalent control price for kerosene in Bujumbura in 1980.

**TABLE II**  
**BURUNDI: PEAT '11 PROJECT**  
Benefit-Cost Analysis at 15% Discount Rate and Internal Rate of Return

Production Valued in Terms Domestic Market  
(in Constant 1980 Prices and \$000)

Year	Peat Production	<u>Benefits</u> <sup>1/</sup>			<u>Costs</u> <sup>2/</sup>					
		Increased Rural Incomes (Bog Laborers)	Consumer Surplus	Total	Discounted Total	AID	Other Donors	GRB/ONATOUR	Total	Discounted Total
1	357	133	99	589	512	1571	360	586	2517	2189
2	584	98	260	942	712	2022	240	589	2851	2155
3	853	127	541	1521	1000	1498	240	689	2427	1596
4	1086	158	1078	2322	1328	1166	240	791	2197	1257
5	1357	190	2403	3950	1963	247	240	953	1440	716
6	1491	216	2948	4655	2011	-	-	1061	1061	458
7	1628	232	3511	5371	2019	-	-	1254	1254	472
8	1694	242	3704	5640	1844	-	-	1111	1111	363
9	1694	242	3905	5841	1658	-	-	1195	1195	339
10	1694	242	4116	6052	1495	-	-	1512	1512	373
11-20	15498	2253	41838	60387 <sup>3/</sup>	7656	-	-	12273	12273	1538

Benefit Cost Ratio = 22,198 divided by 11,456 = 1.94

I.R.R. = 38.2

- <sup>1/</sup> Inflation has not been included as it is assumed that both costs and benefits inflate at the same rate. However calculation of the consumer surplus is based on expectations / charcoal prices will increase at rate faster than general inflation due to increasing scarcity of wood /that
- <sup>2/</sup> All cost inputs are based on year of disbursement, not the year of obligation or commitment.
- <sup>3/</sup> Includes residual value in assets of \$798,000.



TABLE III  
BURUNDI: PEAT II PROJECT  
Benefit Cost Analysis at 15% Discount Rate and Internal Rate of Return  
Production Valued in Terms Import Equivalent  
(in constant 1980 Prices and \$000)

<u>Benefits:</u>					<u>Costs</u> <sup>2/</sup>				
Year	Peat Production <sup>1/</sup>	Increased Rural Incomes (Bog Laborers)	Total	Discounted Total	AID	Other Donors	GRB/ONATOUR	Total	Discounted Total
1	1510	133	1643	1429	1571	360	586	2517	2189
2	2310	98	2408	1820	2022	240	589	2851	2155
3	3266	127	2393	2232	1498	240	689	2427	1596
4	3854	158	4012	2295	1166	240	791	2197	1257
5	4404	190	4594	2283	247	240	953	1440	716
6	4543	216	4759	2055	-	-	1061	1061	458
7	4708	232	4940	1857	-	-	1254	1254	472
8	4865	242	5107	1670	-	-	1111	1111	363
9	4777	242	5019	1659	-	-	1195	1195	339
10	4667	242	4909	1212	-	-	1512	1512	373
11-20	38065	2253	41116 <sup>3/</sup>	5274	-	-	12273	12273	1538

Benefit Cost Ratio = 23,786 divided by 11,456 = 2.08

I.R.R. = 89.22

- <sup>1/</sup> Value in terms of KCal equivalent of kerosene C.I.F. Bujumbura (40.365/per liter). Downward adjustments made based on cost of transport bog site to Bujumbura for portion production to be used in urban center.
- <sup>2/</sup> All cost inputs are based on year of disbursement not the year of obligation or commitment. Inflation has not been included as it is assumed that both costs and benefits inflate at the same rate.
- <sup>3/</sup> Includes residual value in assets of \$798,000

general inflation. Instead it has been estimated that charcoal would increase in price at the rate of the percentage drop in forest reserves in the year previous to the increase. This price increase would result from both the increasing scarcity value of charcoal and increased transportation distances. By 1986, wood availabilities are not likely to support charcoal production. It has therefore been assumed that charcoal users would be converted to kerosene at that point. The price used per ton of charcoal from that point on was the kilo-calorie equivalent of the 1980 control price of kerosene in the Bujumbura market. The "with project" price was subtracted from the "without project" price to determine the amount of the consumer surplus. The KCalories of peat, charcoal, and kerosene used to determine the equivalencies were 2900, 7200, and 10,400 respectively.

B. Import Equivalent Case

In this case, the equivalent import value of peat was added to the increased rural incomes benefit to indicate the benefit incidence of the project. This approach is justified by the fact that Burundi will have no choice but to use its scarce foreign exchange to import fuels over the coming years unless peat production from the Grand Marais becomes available. Accordingly peat production was valued in terms of the C.I.F. price of the equivalent KCalories of kerosene. Recognizing that transportation costs were an element in the price of kerosene, the value of peat has been reduced in line with the cost of transporting that portion of production which is to be used in Bujumbura.

### EXHIBIT 3: TRANSPORT COSTS

Annex F  
Exhibit 3

Recognizing the problems ONATOUR faces in developing a viable production and marketing organization, the PP team has decided that ONATOUR should not undertake the additional management and capital expense necessary to acquire and operate a transport fleet. Instead, ONATOUR should attempt to maximize sales at the bog site and hire transportation from OTRABU, the government transport company, or private transporters for that portion of the peat which is to be sold to domestic, industrial and artisanal customers in Bujumbura.

OTRABU currently charges 22 F Bu per ton/kilometer for its 6, 8- and 13-ton trucks. This is a control price and is the maximum price private transporters are permitted to charge; however, the latter give discounts to good customers. These charges are applied on a round trip basis, Bujumbura to the point of collection and return. Transportation from the nearest bog site, Kashiru, incurs a charge for a 100-kilometer trip, while that from the largest bogs, Katanga A and B, for a 254-kilometer trip. As a result, the average figure for transportation of one ton peat from the bog sites to Bujumbura will be on the order of 5100 F Bu (\$56.60) in 1980 prices.

When these charges are added to the cost of producing peat (2575 F Bu/\$28.50 at 1980 prices), the Bujumbura price of the KCal equivalent of peat will be nearly the same as that of charcoal

(23.44 FBu/\$0.26 for peat as opposed to a current retail price of 25 FBu/\$0.28 for one kilo of charcoal). During the period when ONATOUR is developing consumer acceptance, a greater price difference will be needed to induce consumers to move to a new fuel. ONATOUR management will have to give careful attention to the allocation of production based upon its proximity to various markets if this problem is to be overcome. For example, supplies at the bogs furthest from Bujumbura could be allocated to customers such as the military who instead of bringing to Bujumbura might use them at camps close by (Bururi, for example). Supplies from the closest bogs, Kashiru and Kuruyange, could be brought to Bujumbura by ONATOUR (5500 MT would be available from Kashiru and Kuruyange and could be transported for an average cost of only 2900 BuF per ton). In 1982, more supplies would have to come from further away; however, analysis of availabilities from the various bogs indicates that the costs of transportation could be phased upwards slowly as a greater percentage of Bujumbura's requirements comes from the more distant bogs.

In addition, transportation costs should decrease in real terms over the next few years as the roads from the bogs are improved. The Chinese are presently upgrading and paving a road which will extend within a few kilometers of all the bogs except Nyacijima (which is already well served by roads).

Another possibility which should be explored by ONATOUR is the elimination of round-trip transport charges. It is possible that OTRABU could carry cargo for other users up-country and charge ONATOUR only for the distance they actually carry peat. Private transporters, and in particular the owners of small trucks who currently transport charcoal, may also be interested in collecting supplies at the bogs for transportation to Bujumbura. All these avenues should be carefully explored both to lower the price of peat in Bujumbura (transportation accounts for roughly 2/3 the wholesale price after) and to reduce the economic costs of transporting peat.

Social Soundness Exhibits

EXHIBIT 1: SOCIAL FACTORS AND THE BUJUMBURA DOMESTIC MARKET

The capital city of Bujumbura is the principal urban center of the country and has approximately 150,000 inhabitants. The city's rate of growth is estimated to be between 4-6 percent annually. Eighty-six percent of the residents live in poorly equipped sections of the city and seven percent live in areas classified as modest, and seven percent live in well-equipped sections of the city. Outside the city boundaries about 18,000-20,000 people reside in spontaneous settlements with little access to services or modern facilities.

A study financed by the World Bank provides information on the eight modest and poor sections of the city and one spontaneous settlement zone. In the eight sections with a total of 21,260 households, 40 percent of the households have a monthly revenue of less than 5,000 FBU (\$US 55) and a further 43 percent have an average monthly income of between 5,000 - 15,000 FBU (\$55-165). Only 17 percent of the households in these sections receive more than 15,000 FBU per month. In comparison, outside the eight sections, 89 percent of the households are in this higher income bracket. The threshold of poverty in Bujumbura in 1979 was estimated to be 13,400 FBU (\$145) per month per household. An estimated 11,972 households or 51 percent of all the households in Bujumbura are below the poverty line. An analysis of the main categories of expenditure shows that 60-70 percent of the monthly income of households in the poorer sections of the city is spent on food. The expenditures on fuel vary between 500-2,000 FBU (\$5.50-22) per month for 75 percent of the households.

An estimated 40 percent of the heads of households do not hold salaried positions: however, many operate in the informal sector.<sup>1</sup> In the six poorer zones, the main occupations found among heads of households are agriculture (19 percent), administrative work (19 percent), and commerce and restaurants (13 percent). Others are engaged in occupational categories, such as mechanics, masonry and carpentry, which contain less than five percent of the household heads. In the six poorer sections of the city, there are 17 brick-makers and 548 masons.

For the heads of households, over sixty percent in each section have lived there for more than ten years, with a significant percentage having been born in that area. Only Ngagara, the better section, and Bwiza contain more than 10 percent who have lived in their sections for less than three years (12 percent and 13 percent, respectively). Thus, the data show a highly stable population among household heads. Moreover, 67 percent of the heads of households either own their place of lodging or have it on lease-purchase arrangement.

<sup>1</sup> Regretably, information is not available on the sex of the household heads.

At least 75 percent of the dwellings have tin or metal roofs, whereas the others are thatched. Straw roofed houses are more common in the spontaneous zones than in the other areas.

A small survey of households in the poorer sections of the city was undertaken by the PP team sociologist and the data should be taken as indicative. A more thorough investigation has just begun by a sociologist under the Peat I Project. The survey revealed that even poorer households tend to purchase charcoal for fuel, rather than rely on firewood. There is a category, however, of absolute poor who depend on collecting firewood, debris, etc., for their fuel.

The amount of charcoal used per month depends on the number of people for whom food and hot drink is prepared, the number of times per day the fire is started and the length of time the fire continues as well as the availability of money for purchasing charcoal. In general, it is estimated that households tend to use one to one and a half bags of charcoal (25-40 Kg) per month. At current prices this costs 625-1000 Fbu (\$7.00-11.10) per month. The preliminary survey revealed great variances: two bags per month when cooking for two persons and lighting a fire four times a day, to one and a half bags when cooking for 10 persons and lighting a fire twice a day. In addition to a fire for preparing food and beverages, some people light a fire to warm the house when it is chilly. About half the households cook inside the house both during the rainy and dry seasons. Others cook outdoors during the dry season, often under the overhang of the roof, but inside when it rains. Relatively few households have a separate building or room for cooking. Almost all the households, however, own an imbabura, a metal cooking device, and use metal cooking pots. Cooking is usually done by the women during the morning and the food is eaten at noon. Leftovers are reheated for dinner. The most common dishes fixed are beans, sweet potatoes, casava and ugali (a paste made from flour), although the diet may vary according to the agricultural season. Most food is boiled. Tea is the popular hot beverage.

Urban households, particularly in Bujumbura, are great potential users of peat. Moreover, even a large segment of the poor urban dwellers (earning under 13,400 Fbu per month) are potential users. First, many of them are already dependent on purchased fuel. Second, most of their houses have metal roofs so there is little potential danger of fire from sparks. Also, the population is relatively stable, living in houses they own or are purchasing, so this factor will not significantly impede investing in a permanent structured cooker.

A trial was carried out in poor households in three sections of the city. The aim was to test use of peat in an open fire and in an imbabura. Nine willing female participants were given a bag of peat and instructed to:

1. start the fire outdoors when there is a breeze
2. start the fire with other materials, e.g. sticks, before adding the peat.

3. if they use a metal pot, keep it directly off the coals
4. cover the pot tightly with a lid to prevent smoke from tainting the food.

Regretably, information was not available at the time of the trials on the proper way to stack the peat to avoid smoke and to get good combustion. (Not until the arrival of an Irish peat expert was the proper technique known.) The results revealed negative and positive aspects. The women complained that it takes too much time for the peat to catch fire and that it emits too much smoke. Nevertheless, once the peat caught fire, they were pleased with its quality. In particular, they thought that the peat was better than charcoal or firewood for cooking beans since they did not have to continually add fuel. They found that it was best to use the peat in an open fire rather than an imbabura. There were no complaints of the smoke tainting the food.

A second trial will be carried out by the sociologist under the Peat I project to test the use of peat with an open fire and an imbabura when instructions are given for the proper technique of stacking and lighting a peat fire. The trial will also assess cooking time. The results will indicate whether or not encouragement of domestic use of peat should be tied with the demonstration of improved cookers. Currently it is anticipated that peat use will need to be accompanied by introduction of modified cookers and/or stoves since a great deal of heat is lost in an open fire process and there is not enough space between the peat and pan in imbaburas. Under the Peat I Project, a model clay stove with a chimney is being developed. Other models will also be devised by a short-term consultant under this project. Only slight modification of the existing imbabura is necessary to adapt it to peat use. A portable model is very important for those who cook both outdoors and indoors. All models will be initially tested in homes to check durability of construction materials and user acceptability. A REDSO/EA sociologist will provide guidance on key factors with which to assess user acceptability. Interviews were carried out by the PP team sociologist with women in poorer sections of Bujumbura to provide guidance on construction of cookers, e.g. height of cooker, location and number of cooking spaces. The sample was too small to provide conclusive data. Therefore, the sociologist under the Peat I Project will continue to inquire into the women's preferences for an indoor, outdoor or portable cooker, number of cooking spaces, and stove locations.

After successful models have been identified a demonstration effort will be undertaken. Approximately 120 demonstration models and a two-month supply of peat will be provided to a sample of willing demonstrators from households:

1. with a monthly income of less than 15,000 F.Bu per month
2. currently purchasing fuel
3. willing to demonstrate its use to others and



4. willing to make a nominal financial contribution  
(expected to be less than 400 F.Bu, or \$4.50).

The demonstration models will be allocated to at least five districts in Bujumbura and one spontaneous settlement zone on the basis of the proportion of its population earning less than 15,000 F.Bu per month. A sociologist will work with the ONATOUR marketing section on the selection of demonstration households and on establishment of small-scale monitoring and evaluation systems for the demonstration phase.

In the process of constructing demonstration models, at least one artisan from each section will receive on-the-job training. Additional funds may be used to provide training for more local artisans in the construction of cookers. Also, the demonstration effort will be coordinated with the establishment of a marketing system within the different sections of the city.

EXHIBIT 2: SOCIAL FACTORS AND THE RURAL SECTOR

A. RURAL PROFILE

Approximately 97 percent of Burundi's four million reside in rural areas. The population density varies from 50 to 300 people per km<sup>2</sup> with a national average of 143 persons per km<sup>2</sup>. The basic unit in rural areas is the family. The farm family lives in a homestead, which on average contains six persons and 1.3 family units. There are two commonly found structures of house. One is the traditional round house with a conical shape roof, with thatching which comes almost to the ground. Also one finds houses of clays walls and thatched roofs. Both types have dirt floors. Only about three percent of the rural homes have metal roofs. The households are primarily dependent on agriculture to meet their main food needs and produce a cash income. About 56 percent of Burundi's arable land is under food crops, two percent devoted to industrial crops (coffee and tea) and 36 percent is grazing land. The cultivated land averages less than one hectare per family. Less than 40 percent of the population own cattle.

The households which are potentially peat users are those in the region of the bogs and along the main roads from the bogs to Bujumbura. A preliminary survey undertaken by the PP team sociologist in the rural areas near the towns of Ngozi and the peat bogs at Kishiro and Kishubi provides indicative data on poorer households in these areas. She found that all the households rely on wood for fuel, although the poorer ones sometimes use agricultural residue or animal dung during the dry season. Animal dung is considered preferable to agricultural residue, such as maize or millet stalks, since the latter burn very quickly. In the Kishubi area some interviewees mentioned that when wood was more scarce 20-40 years ago, animal dung and agricultural residues were more commonly relied upon as sources of fuel. Currently most homesteads have their own stand of trees, but in the Kishubi and Kishiro areas these are usually insufficient to meet annual requirements. In comparison, in the Ngozi area, because of the reforestation efforts, many families are able to meet their firewood needs from their own small woodlots. About 75 percent of the women interviewed claimed that it is difficult to locate free firewood. They often search for fallen branches on neighboring homesteads and along the roads. When asked what they will do when it becomes more difficult to find firewood, many replied that they would plant tree seedlings. One-third of the interviewees had no idea what they would do.

Many rural households in Kishubi and Kishiro areas occasionally purchase firewood, particularly during the rainy season and cultivation period, although purchase is dependent on the availability of funds. Firewood is sometimes purchased in order to allow a homestead's own trees to grow to sufficient size for cutting. One usually purchases a tree rather than a bundle of firewood. A medium-size tree tends to cost 150-200 F.Bu (\$1.65-2.25) and a larger one 300-500 F.Bu.

(\$3.40-5.50). It appears that a large tree lasts a family for one month.

Almost all rural families cook on an open fire and use clay pots, although some also own metal pans. In the high altitude areas of Kishiro and Ngozi the women cook indoors both during the dry and rainy seasons. Fear that the wind would blow sparks from an open fire into the buildings was expressed as a reason for cooking indoors. In comparison, some of the women of Kishubi area cook outdoors during the dry season, taking precaution against the possibility of an uncontrollable fire. A few have an outdoor shelter under which to cook.

Particularly in the Kishiro area, people frequently light a fire to warm the house. Usually a fire is lighted two to three times a day, although during the cold period some keep one going all day in the house. Cooking is done in the morning, the food consumed at midday, and leftovers reheated later in the day. When the women are busy in the fields food is frequently prepared in the afternoon, eaten in the evening, and leftovers warmed the next morning. The diet varies according to the season, with beans and ugali (paste made of cassava, millet or wheat flour) as the staple foods, but cabbage, sweet potatoes and cassava are also frequently consumed.

Given current availabilities of firewood, it is doubtful that within the next five years the majority of rural families who would have easy access to peat could rely solely or even mainly on peat for fuel, primarily because of lack of funds. However, the sociologist under the Peat I Project will further investigate this issue by inquiring about sources of income, rights over disposal of income and responsibilities for any fuel purchases as well as expenditure patterns. It is hypothesized that:

1. Households are dependent upon men's willingness and ability to provide money to purchase fuel.
2. The major expenditure which benefits family members is for food.

Even if the majority of rural families with easy access to peat will not directly benefit from the proposed project within the next five years, they will indirectly benefit during this period because provision of an alternative fuel to firewood and charcoal will slow down the rate of wood depletion. Also, development of an alternative source of fuel may help keep the price of wood from rising beyond the average means.

Over the long-term, if firewood is unavailable, rural people may have no option but to purchase peat or to change eating habits. The project will address some of the bottlenecks to peat use by the rural people by testing and demonstrating successfully tested cookers.

Peat can be used in an open fire if stacked properly, but by this method much of the heat is lost. In the introduction of the new fuel, suitable cookers are necessary. After an initial testing period, 50

families will be selected to try demonstration models. The selection of families will be based on a stratified sample in order to test:

1. Regional variations, and town versus farming households
2. Variations in house structure and roofing
3. Place of cooking
4. Socio-economic status

At least 30 poorer families, i.e. those with thatched roof houses, as well as some wealthier rural people with metal roof houses, will be included in the sample. The demonstrators will be asked to make a nominal financial contribution, which will be less than 300 F. Bu.(\$3.40).

#### B. Community Exploitation and Small Bogs

Although this component was mentioned in the PID for Peat II, further study indicates that it should be a low priority concern at this state of developing peat as an alternative fuel resource. This decision is based on a number of managerial, technical and sociological factors. Currently no small bogs with good quality peat have been identified. (See technical analysis section for further information.) During the life of the project, however, it may be decided that the possibility should be further investigated.

It is thought that exploitation of small bogs by communities would be feasible from a sociological viewpoint only if there were a high degree of individualization, e.g. control over output. This is based on the fact that Burundi's rural areas are characterized by a strong sense of family identity and an absence of a community social structure, with a significant degree of cross-cutting ties of loyalty and mutual cooperation. Families are clustered into homesteads and these rural homesteads share a geographic area, a hill with roughly a dozen similar units which may or may not be occupied by kinsmen. Also, there is not the tradition of community work parties as found in other African societies. (Homesteads are required one day a week to perform work identified by their local government administrative unit).

Furthermore, there is no formal cooperative system operating in the country. For example, neither coffee nor tea producers are organized into cooperatives. The relatively few cooperatives which do exist have been established by missions and foreign agencies. (See the Economic and Social Analyses sections of the Route 480 PP). These agencies have performed supervisory and auditing responsibilities. The lack of an existing formal system under which a community cooperative effort could be linked on a permanent bases impedes the viability of such an undertaking.

While the project does not anticipate a large number of rural poor adopters of peat because of their inability to purchase fuel, it will address adoption problems due to an improper cooker. Thus it will pave the way for peat adoption when there is a diminished supply

of free fuel and permit a possible dual system, i.e. using both peat and firewood, by households currently purchasing fuel from time to time. Furthermore, the Bururi Forest Project, scheduled for USAID financing, will contain a component for the introduction of low-cost, more efficient stoves to reduce the amount of firewood needed by rural households. The models found to be feasible are expected to be widely disseminated.

EXHIBIT 3: PROJECT IMPACT ON RURAL WOMEN

Rural women will benefit from the employment generated by the project to the extent that their husbands and/or male relatives provide them money from wages earned, and spend income on items which benefit the women. It is not expected that women will be employed on the bogs since they are fully engaged with household responsibilities. However, rural women will indirectly benefit by the multiplier effect of the income spent in the rural areas.

Rural women are responsible for child care, almost all farming tasks, meal preparation and numerous other chores as well as household management. When twenty-five women residing in the Matana and Ijenda areas (Kishubi and Kishiro bog areas respectively) were asked by the Project Paper sociologist if they thought that women should be employed on bog sites, all except one replied no. They pointed out that women and young unmarried girls have important household responsibilities which cannot be neglected. A few mentioned that work on the bogs was strenuous.

Inquiries were also made to assess if the off-the-farm employment has a negative impact on women through increasing their workload. In the Kishiro area the husbands used to assist by clearing the fields, but now they are unable to perform this task due to their employment on the peat bog. Instead, most seem to provide money to hire laborers, for roughly an equivalent of four work days, to clear the fields. In comparison, in the Kishubi area, it appears that some of the men used to help with other agricultural tasks such as planting and harvesting. In such cases the workload during the dry season does increase for the other family members, but none of the women regarded it as a critical problem. Almost all those employed on the peat bogs, however, are available for farm work during the rainy season.

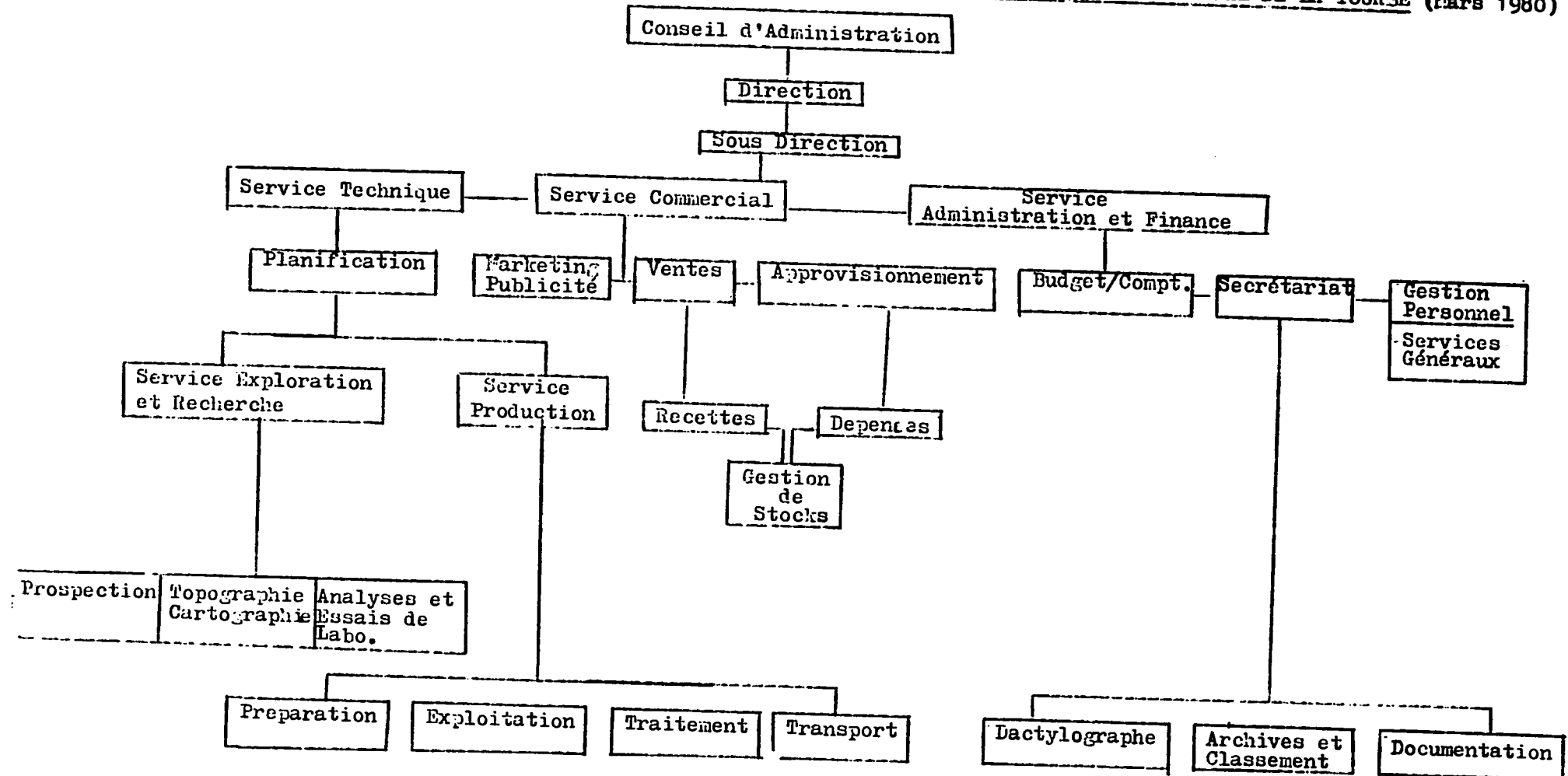
Women in rural areas who are active in market trade and selling beer will indirectly benefit from the employment generated under the project. As mentioned previously, the wages are spent on items such as food, locally made household items and beer. Many rural women brew beer for selling and some even purchase bottled beer for resale.

Approximately 50 rural women and their families will directly benefit under the project by receiving, with nominal charge, cooking devices and about a two month's supply of peat. These women will be testers and demonstrators of cooking models developed under the Peat I Project and this project.

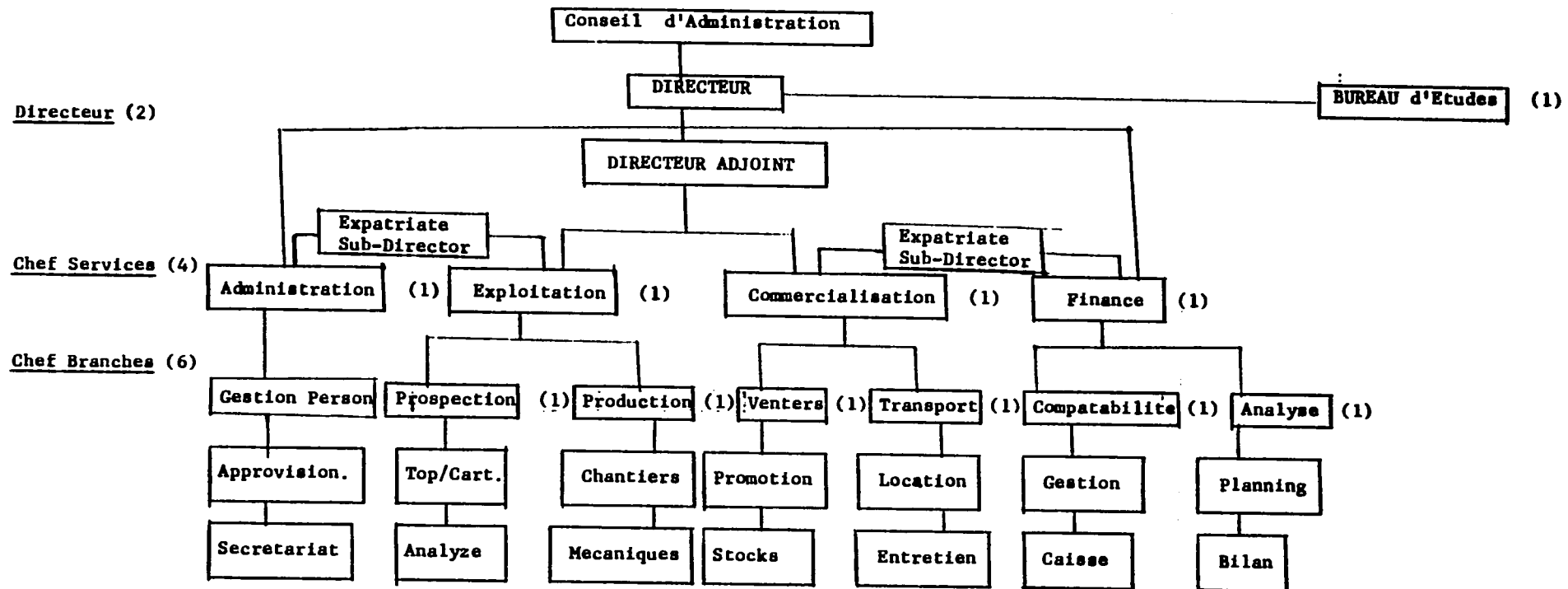
BURUNDI: PEAT II PROJECT  
CURRENT ONATOUR ORGANIGRAM

ANNEX H  
Exhibit I

ORGANIGRAM DE L'OFFICE NATIONAL DE LA TOURÉE (Mars 1980)



BURUNDI, PEAT II PROJECT  
PROPOSED ORGANIGRAM (ONATOUR)





**TITLE:** Marketing Expert (May also serve as Chief of Party).

**DUTY STATION:** Bujumbura, Burundi

**DURATION:** 4 years

**QUALIFICATIONS:** Preference will be given to candidates with University degrees in economics, agriculture or closely related background. Candidates without degree level professional qualifications may be considered if they have proven experience in executive type positions with agricultural production and marketing organizations.

**EXPERIENCE:** Several years experience in a marketing and production function with agricultural produce boards or similarly related organizations. Experience in working in third world countries desirable.

**LANGUAGE:** Conversational and written competence in French essential.

**DUTIES:** The expert either will be the COP or be responsible to the COP and will work in close collaboration with the Director and staff of ONATOUR.

Specifically, his duties will include the following:

- assist ONATOUR in the development of peat production and marketing in Burundi, particularly in the domestic and artisanal sectors;
- establish promotional campaigns to stimulate consumer knowledge on the use of peat, as well as the use of ancillary cooking equipment;
- train ONATOUR staff in the practical aspects of production and marketing including determination and adjustment of various production levels, stock control, transport, storage, market analysis, unit costing, pricing, etc., and assist with the institutional organization of the Marketing Service;
- advise the Director of ONATOUR on marketing policy.

(If selected as COP, see following description for additional qualifications and duties).

**TITLE:** Financial Expert (May also serve as Chief of Party)

**DUTY STATION:** Bujumbura, Burundi

**DURATION:** 4 years

**QUALIFICATIONS:** Approved qualification (i.e., degree or its equivalent) in accountancy from a recognized organization or institution specializing in this discipline, or in articles obtained during apprenticeship to an accounting firm.

**EXPERIENCE:** Several years of practical experience with organizations in the marketing or agricultural development fields with financial management and administrative responsibility. Experience in working in third world countries desirable, particularly those employing the OCAM accounting system.

**LANGUAGE:** A knowledge of French desirable but not essential. If the candidate has no French, he will be expected to learn this during his duty tour. (S-3 essential if selected as COP).

**DUTIES:** The expert either will be the COP or be responsible to the COP and will work in close collaboration with the Director and staff of ONATOUR.

Specifically, his duties will include the following:

- assist ONATOUR with the development of basic and cost accounting systems through staff training, the introduction of business accounting methods and institutional organization of the Accounts Service;
- train ONATOUR staff in analytical accounting including investment and budgetary planning, preparation of cash flow statements, cost benefit analysis and feasibility studies;
- control the financial budget of the Project;
- assist ONATOUR in day-to-day administrative matters;
- advise the Director of ONATOUR on financial policy and planning as well as administrative matters.

(If selected as COP, see following description for additional qualifications and duties).

**TITLE:** Chief of Party (COP): This is not a separate position. The Chief of Party will be either the project's financial or marketing expert depending on experience, education, language ability, etc. The qualifications and duties listed below will be additional to those outlined for either the financial or marketing position.

**DUTY STATION:** Bujumbura, Burundi

**DURATION :** 4 years

**QUALIFICATIONS:** Preference will be given to candidates with advanced degrees in Management, Public Administration, or Business Administration. Candidates without graduate level professional qualifications may be considered if they have proven experience in executive positions in agribusiness-type organizations.

**EXPERIENCE:** Experience in administrative function with an agribusiness or other relevant firm. Experience with management of Third World enterprises is highly desirable.

**LANGUAGE:** Conversational and written competence in French essential (S-3).

**DUTIES:** The expert will be responsible to the USAID AAO and will work in close collaboration with the Director and staff of ONATOUR and the expatriate experts.

Specifically, his duties will include the following:

- conduct project administration on a daily basis, including responsibility for all procurement, and the recruitment, training and direction of all local project staff;
- coordination of the functions of other project experts and field managers, local project staff, and ONATOUR staff;
- advise ONATOUR on management techniques, including effective decision-making, personnel management, medium and long range planning, scheduling and coordination of work assignments, and formulating official ONATOUR policy;
- submission of quarterly progress reports

2.

covering activities of all project personnel and the implementation of the project plan of action and submission of semi-annual financial reports;

- liaison with USAID officials, relevant government agencies and other international organizations involved in the peat effort or related enterprises.

**TITLE:** General Engineer

**DUTY STATION:** Bujumbura, Burundi

**DURATION:** 2 years

**QUALIFICATIONS:** University degree or equivalent engineering certification.

**EXPERIENCE:** Proven experience in one or all of the following areas: Civil Engineering involving land drainage; soil excavation techniques; operation and servicing of mechanical equipment; peat production; building construction.

**LANGUAGE:** A knowledge of French desirable but not essential. If the candidate has no French he will be expected to learn at least a basic working ability (S-1+ or S-2) during his duty tour.

**DUTIES:** The General Engineer will be responsible to the COP and will work in close collaboration with the Director and staff of ONATOUR. Specific duties will include:

- supervision of ONATOUR headquarters construction;
- layout of drainage systems for peat bogs to be exploited under the Project;
- supervision of the use and maintenance of machines utilized for peat exploitation;
- testing and controlling the most suitable methods of producing peat in Burundi;
- maintaining a quality control system to ensure an acceptable quality of peat is being marketed;
- training of a counterpart engineer;
- advise the Director of ONATOUR on construction, drainage of bogs, machine use and maintenance, quality of control.

**TITLE:** Mechanical and Maintenance Specialist(s)

**DUTY STATION:** Up-country site(s)- to be selected

**DURATION:** One specialist for four years, another for three years.

**QUALIFICATIONS:** General secondary school certificate desirable.

**EXPERIENCE:** The mechanical and maintenance specialist(s) must have considerable experience in the overhaul and maintenance of bog-type machinery - preferably sod peat excavators (baggers). Experience should include welding, fitting, engine overhaul and maintenance, and the ability to organize machine maintenance activities over a large number of bogs.

**LANGUAGE:** Some knowledge of French is desirable but not essential.

**DUTIES:** The mechanical and maintenance specialist(s) will be responsible to the General Engineer and Chief of Party and will work in close collaboration with the staff of ONATOUR. Specific duties will include:

- overhaul and maintenance of bog machinery (engine overhaul, welding, fitting, etc.);
- organization of various maintenance activities including maintenance scheduling, equipment records, and inventory control of spare parts.
- training of at least two staff members of ONATOUR to a skill level sufficient to assume all regular and most special maintenance responsibilities for bog machinery.
- preparation of monthly progress reports

**TITLE:** Bog Supervisor(s)

**DUTY STATION:** Up-country peat excavation sites

**DURATION:** 2-4 years for each supervisor. Number required - 3 in 1981, 4 in 1982, 4 in 1983, 3 in 1984.

**QUALIFICATIONS:** General secondary school certificate desirable.

**EXPERIENCE:** The Bog Supervisor(s) must have several years (preferably 5 or more) supervisory experience in small and/or large bog peat production.

**LANGUAGE:** Knowledge of French desirable but not essential.

**DUTIES:** The Bog Supervisors will be responsible to the General Engineer and the Chief of Party.

Duties will include:

- the management of peat extraction at highland peat sites; this will include supervision of labor, execution of planned extraction programs, identification of machine maintenance requirements, drainage and rehabilitation of sites, replanting of trees, and the keeping of simple management records;
- supervision of mechanical extraction methods (with perhaps 6 or more semi-automatic machines per bog);
- maintain accurate records of stocks, sales and deliveries;
- preparation of monthly progress reports.
- training of local counterpart supervisor(s) in all aspects of bog supervision, including organization of labour and machines, drainage and conservation techniques, financial and production records and reports, etc.